# Pit and Quarry

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HARRY W. BAUMGARTNER, President
V. E. LARSEN, Vice-President
S. E. COLE, Eastern Representative
1235 Watchung Place
Plainfield, New Jersey

HAROLD W. MUNDAY, Editor
JOHN O. DURKEE, Associate Editor
GEORGE B. MASSEY, Associate Editor
F. A. WESTBROOK, Associate Editor
W. E. TRAUFFER, Associate Editor

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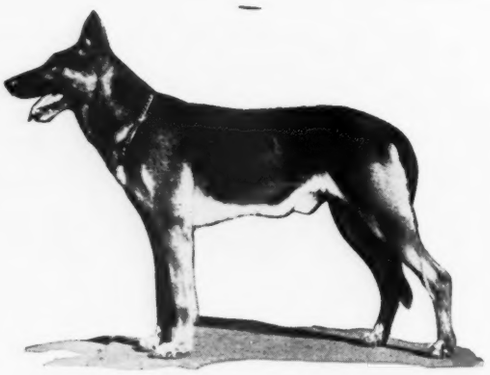

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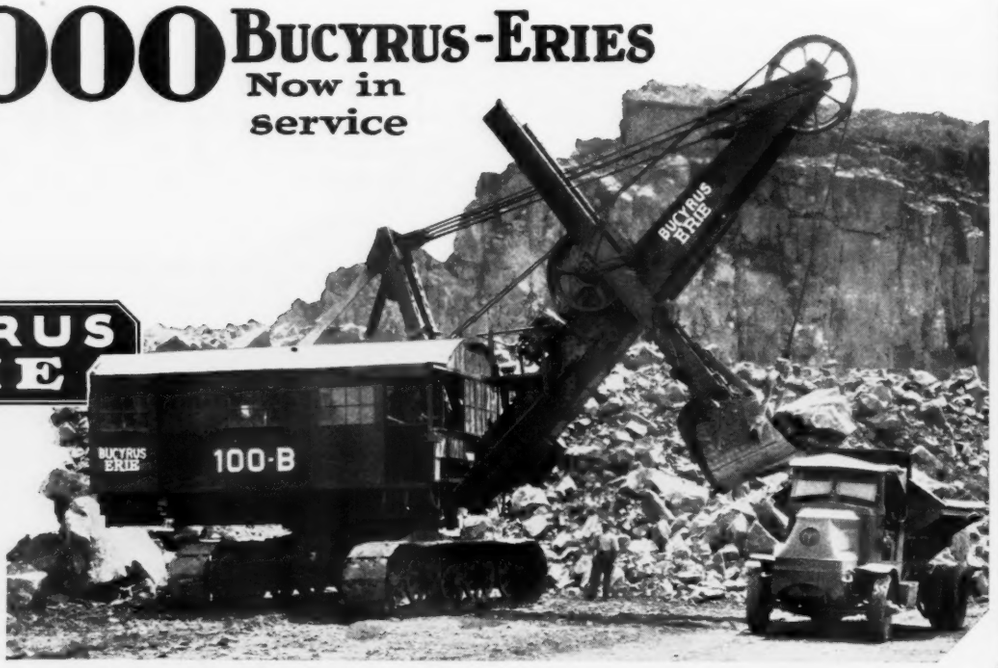


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# ECONOMY IS NECESSARY AT ALL TIMES

ECONOMY is more easily practiced when we are in the throes of business depression than when we are enjoying prosperity. This is true with the individual in his personal financial program and with the business organization. The effect of prosperity is to bring about increased waste and reckless expenditure. If money is easily acquired, it is readily spent; if business is good, everyone in the organization responds to a spirit of financial ease which permeates the plant. Requisitions increase in number and size; material is wasted; an easing up on the tension is apparent all along the line. On the other hand, when it is known that business is unstable, that times are hard, it is easy to carry through a rigid program of economy. All members of the organization from manager or superintendent to errand boy join in an organized effort to bring about a successful drive for economy. Of course, the motive is self-preservation. If jobs are at stake, fear lurks in the background, furnishing ample incentive for cooperation. When the danger passes, fear fades away and a spirit of indolence and indifference sometimes pervades the group. No one would prefer business depression and hard times to prosperity. There are, however, some valuable lessons learned during those troublous times which should not be forgotten nor discarded when the need for them is less urgent.

The executive who successfully retains a practicable program of economy when business is good has solved an important problem of management. To do so he must be exceedingly skillful. The need for economy is not apparent to the men; the practice of economy is not always pleasant. He must make it a habit. He must convince his employees that economy is necessary both for the present and for the future; that it is in the long run advantageous to every one in the organization; and that it does not increase the burdens for any one. Extravagant buying, undue waste of time and material, unwarranted labor turnover, carelessness in the use of tools, unnecessary destruction of expensive machinery, discarding machinery which could be repaired—these are the problems which confront the executive who attempts to solve this problem of economy during "good times." If he does not check such wasteful practices and devise a method of economy that will function continuously and satisfactorily, he faces the danger of being swept under when any adverse current of the business cycle comes his way.

A study of the business cycle convinces the executive that he must be ready for any emergency. When the weather is fairest, he must be glancing about for the ominous cloud. The business cycle is a modern phenomenon which must be reckoned with. Prices rise and fall; production increases and decreases; orders accumulate beyond capacity and suddenly disappear. Depressions give place to business booms from which come crises which in turn lead to depressions. Lean years follow fat years now as in bygone centuries. A vast system of production is built upon the estimated strength of the market. Contracts are good just as long as the structure is strong. When one man fails to meet an obligation, others are affected. When the system of contracts breaks down, a crisis comes. Dealers are overstocked; establishments are overcapitalized. Then comes a recovery of business from the period of depression. There is some slack or surplus, not only in the supply of credit, but in the supplies of labor, of materials, and of the instruments of production as well. With the expansion of business, shortages appear in these different fields as well as in field of credit. Increased costs require that a rising price level of profits be maintained.

A careful investigation of the regular occurrence of these periods of depression and prosperity which constitute the business cycle will reveal the character of the difficulties and temptations which business men must face in a period of active business. Failure to consider the cyclical nature of prices

and business activity in one period accounts for difficulties encountered in subsequent periods of deflation and depression. Far sighted executives have become aware of the value of budgets and of other systems of financial and operating control. They are recognizing the value of technological research, of labor saving machinery, and of plans for scientific selection, training and remunerating their employees. They are endeavoring to eliminate all unnecessary cost elements. They are aware of the danger of falling into careless methods during periods of prosperity and of suffering proportionately when the period of depression comes.

There are many phases of this subject of a program of economy. All operating problems should be considered with regard to possible periods of prosperity and of depression. Building up a structure along lines of economy requires keen foresight and rare judgment. To secure the cooperation and good will of the employees is one of the most practical achievements of an executive. To convince them that skill and economy are essential to successful operation is an important part of his work. To establish a routine which is efficient, satisfactory and permanent is a necessity if maximum production is to be secured. Those employees who are inclined to relax during the period of prosperity should be convinced that such a policy is as detrimental to themselves as to the company. Those who become careless or reckless in their use of equipment should be trained into habits which will be valuable to themselves and to their employer.

In every plant there are possibilities for greater economy; there are various kinds of wastes that can be studied and either cut down or eliminated. There is waste from labor turnover, from labor conflicts, from over-production and less than capacity production, from excessive seasonal operation, from lack of standardization, from lack of skill in management. There is waste due to failure to make proper use of the time and energy of the men; there is waste from failure to use proper equipment, up-to-date machinery and new processes in production. There is waste due to failure to have duties specifically outlined and authority properly delegated.

To secure economy in a plant requires both cooperative and individual effort. Each individual—plant executive and worker—must discover opportunities for improvement and assume responsibility for the performance of his own task. The responsibility however, for any condition of waste or the absence of a reasonable program of economy rests in the last analysis with the chief executive of each company. While it is important that they devote considerable attention to directing general policies, they cannot be relieved from their responsibility in watching all details of extravagance which develop in the business.

## REFLECTING THE FUTURE

BY ELECTING Herbert Hoover as the next president of the United States, the people of this country have indicated their confidence in him to continue or further our prosperity.

Regardless of our politics individually, we may accept Mr. Hoover's record as a demonstration of the requisite and potent qualities to guarantee maintenance of abounding prosperity, efficiency in government, and a sympathetic approach to every problem in human welfare. He has accepted great responsibilities before and carried them through readily, successfully, and unselfishly. By his training and experience he is enabled to analyze and solve each problem with the logic and finesse of the engineer.

We are living in an age dedicated to the realization of higher ideals in better social and economic conditions through more scientific application of principles. That the people of this country recognize this fact is clearly indicated by their selection of "Hoover, the Engineer" by a tremendous and nation-wide majority.

There can be no doubt that prosperity will continue. Under his leadership national confidence will be reflected in the thoughts and actions of everyone and will be expressed in expansion and increased prosperity through the exchange of one business with another.

We, who are engaged in the production and manufacture of non-metallic minerals for many other industries, may confidently hope for larger markets and stable prices.

Regarding national construction projects, we have elected an engineer and, perhaps, we may expect that an engineer will engineer.

# MEN OF THE INDUSTRY

**The portraits printed on this page in each number of PIT and QUARRY are taken from our files and their selection is without significance as to current events or as to the position of the individual in the industry.**

William A. Armstrong

Mr. Armstrong is President
of the Universal Granite Quarries Company
of Chicago, Illinois

# WESTERN SAND AND GRAVEL COMPANY OPERATES TWENTY YEARS IN SAME DEPOSIT

By W. E. Trauffer

THE Western Sand and Gravel Company of Spring Valley, Illinois, operates a plant near that city the product of which is known throughout that part of the state as Spring Valley road gravel. The plant is located on the Streator-Denrock branch of the Chicago, Burlington and Quincy railroad, which connects with the main line at Zearing, 12 miles north of Spring Valley.

The deposit has a clay content whose binding properties make it ideal for road gravel, for which purpose by far the greater part of the output of the plant is used. The gravel is a very hard trap rock and has very few large boulders, the percentage needing to be crushed varying from 15 to 40 per cent. The plant has an average output of 125 tons per hour but has loaded out 3,300 tons in 20 hours. Operation is almost entirely electric, power coming in from the Illinois Power and Light Company lines at 2,300 volts and being stepped down by three transformers. The transformer for the plant turns out 220 volts, while those for each of the two shovels are 440 volt.

The plant is located on the original 70 acres of land on which operations began, but due to the fact that the deposit there had a high percentage of large gravel and the increasing stringency of the state requirements for road gravel, the pit has for the last few years been worked in a southerly direction. The deposit here runs much finer and has the same clay content. Excavating is now being done almost a thousand feet from the plant, but this is considered more economical than to crush the boulders in the original deposit. This working in a southerly direction has taken operations off of the original property onto a tract owned by J. C. Sitterly, who is leasing it to the company on a royalty basis.

Left, Glenn Sitterly; Center, Lyle, and Right, J. C. Sitterly.

Stripping of the overburden, which is very light, is done by a Thew ¾ yard Type O electric shovel. A Marion 1¼ yard Type 7 electric shovel digs the gravel at the bank, which in some places is 65 to 75 feet in height, and loads it into Western 3 yard dump cars. These cars run on 36 inch track a

View of Pit from South, Showing Depth of Excavation.

Closeup of Revolving Screen.

distance of about 1,000 feet to the plant and are ordinarily handled in trains of four by a Whitcomb 8 ton gasoline locomotive. Two trains are operated at one time, one being loaded while the other is unloaded. Very little moving of the shovel or track is required, due to the height of the bank.

The locomotive hauls the cars to the foot of the incline leading to the plant, where there is a switch track so arranged that the loaded train can be left on one track while the empties are hauled away on the other. The loaded cars are hauled one at a time to the top of the incline by an American Hoist and Derrick single drum hoist operated by an Otis 37 h.p. electric motor and controller. The cars are then dumped by hand into a bin covered with an angle-iron grizzly which rejects all stone larger than 11 by 22 inches.

The material is fed from the bin by a Telsmith plate feeder, spur gear driven by a Westinghouse 5 h.p. motor, into a Johnson and Chapman revolving screen. This screen has an inner and an outer jacket with 4 inch and 1¼ inch perforations, respectively. The material passing the 1¼ inch screen goes through a chute directly into the cars. The material above 1¼ inches discharges into a Smith 11 by 22 jaw crusher, which crushes it to 2½ inch and in turn discharges into a Telsmith elevator with 7 by 14 inch buckets. This machinery is all operated by a G. E. 60 h.p. motor, the crusher being driven by belt, the elevator by chain and the screen by chain and spur bevel gear.

The elevator dumps the 2½ inch stone into a bin

Plant from Northwest Showing Washer House in Center Background.

Plant from Southwest, Showing Car Going Up Incline at Right.

which has gates to allow loading directly into cars. A chute at the bottom discharges into a Telsmith No. 5 gyratory crusher, belt driven by a 30 h.p. G. E. motor, which crushes the stone to 1 inch size. A Telsmith elevator with 5 by 10 inch buckets, belt driven by the same motor, elevates the material to a chute which connects with the one carrying the fines from the rotary screens and discharges into the railroad cars.

Separate from the plant but adjacent to it is a washer unit consisting of 3 circular steel bins of about 50 tons capacity each on top of which is a frame building housing the washing equipment. This has been used very little recently but is put into operation when there is a call for washed gravel. The chute from the bin containing the 1 inch and under material when pulled up automatically runs the stone through another gate into a

Shovel Loading Cars at Bank.

Stocker 10 by 8 inch link elevator which feeds the material to a Stocker scrubber of 30 tons per hour capacity. The elevator is belt driven by a 20 h.p. G. E. motor which also drives the scrubber.

The scrubber discharges into a 4 by 8 foot Universal vibrating screen with ¼ inch mesh driven by a 1 h.p. electric motor. The sand is discharged into the first bin and the oversize, all of which is under 1 inch, into the last two bins. Orders for concrete aggregate are filled from these bins until the supply runs low, when the washer unit is again operated until the bins are full. Washing water is pumped from a shallow well in the pit into the plant by a single stage centrifugal pump driven by a G. E. 10 h.p. motor.

There is ample side track space at the plant for a day's output. Empties are run under the bins by gravity due to the slope of the track and stopped by their own brakes. After loading they are run out of the way in the same manner.

A small but complete machine shop is maintained on the opposite side of the railroad right-of-way from the plant. A Century 5 h.p. electric motor drives an overhead shaft from which are driven a drill press, lathe and emery wheel. An oxy-acetylene welding outfit, blacksmith equipment, forge, etc., and miscellaneous tools complete the equipment. At the time the plant was visited a small tractor, which is used for general work about the pit and plant, was being overhauled by the mechanic. Practically all of the repair work is done here with the exception of electric motors.

The past season has been very busy for this plant, operations having been carried on night and day for the greater part of the summer and fall. For this purpose floodlights were installed throughout the plant and pit. The product is marketed within a radius of 150 miles and is shipped via the C. B. & Q. over the C. R. I. & P., C. & A., Wabash, I. C., N. Y. C., Santa Fe and R. I. Southern railroads. Some is also delivered by truck for use in the immediate vicinity.

The company was organized in 1909 under the present name and began operations in a small way on property leased from J. C. Sitterly. In 1912 Mr. Sitterly became manager of the plant and in 1916 bought the controlling interest. At the present time the company is almost entirely a family affair, as Mr. Sitterly with his two sons and daughter own almost all of the stock. His sons now manage the affairs of the company, Glenn being secretary and treasurer and Lyle plant superintendent.

## Urges Parks and Playgrounds as Safety Measure

A vigorous plea for the construction of more public playgrounds in cities, and foot paths along country roads was made November 10 by the American Road Builders' Association.

"The unwarranted slaughter of children by motor cars and trucks is linked closely with the general problem of safeguarding pedestrian traffic," stated Chas. M. Upham, secretary of the Association. "Statistics show that 7,400 children of school age were killed on the highways of the United States in 1927, and of these children, 3,638 were killed while at play in the streets. More than twice as many children between the ages of 5 and 10 years were killed than of any other similar period of years.

In discussing this problem of child safety Mr. Upham states, "There are entirely too few playgrounds and recreation centers and children in many cities are forced to play in the streets. Roller skating on highway pavements should be discouraged, as well as tobogganing, coasting or sledding.

"Public school officials, parent teacher associations, churches, civic organizations and parents, in particular, are urged to promote the establishment of public and private playgrounds in cities and towns, with a view to affording children a greater number of safe places where they can play."

"More than $1,000,000,000 has already been invested in public parks and playgrounds, covering 250,000 acres, all told, and more than $100,000,000 is being expended annually for their maintenance. Practically all cities with more than 25,000 population have at least one park or playground but many millions of childrens, especially in the smaller cities, do not have access to parks or playgrounds and all too frequently go into the streets. These children should be encouraged to play upon vacant lots where possible.

"Investigation of highway accidents in which children are the victims shows that the principal causes are roller skating; playing in the street; sledding and coasting; stepping from behind passing or parked automobiles or trucks, or in front of backing ones; walking or running in the highway; running around a passing street car; darting out from the curb without observing traffic; hopping on automobiles or trucks, and similar bits of recklessness. Most of the accidents occur during the school vacation periods.

"During the school year the accidents occur principally on Saturdays. Children from 5 to 10 years of age are the most frequent victims. The most dangerous period of the day is from 4 to 6:30 P. M. when the children are more likely to be in the streets and when traffic congestion, due to the rush hours, is heaviest. The slaughter annually of approximately 7,000 future citizens of the United States by motor cars and trucks on our highways can be practically eliminated through education and the exercise of proper caution. Regulation of pedestrian traffic along with vehicular traffic is one remedy that is beginning to receive serious attention.

# THE ROUTINE OF HANDLING INJURIES

By A. V. Drummond*

Industrial Relations Department, Wilson and Company, Chicago, Illinois

AS a matter of convenience and follow through, I am going to treat the subject assigned to me under three general headings—Safety, Medical, and Compensation.

Safety, in my estimation, is the Alpha and Omega in the routine of handling injuries. Constructive safety begins with the injury, as usually it discloses that something is wrong with men, methods or materials. By focusing attention on the causes, it gives us the experience necessary to carry on accident prevention with greater efficiency.

The natural and, at the same time, the imperative thing to do when an injury occurs, is to get the injured party into the hands of the medical department—for examination as to the extent of injury and determination as to proper treatment required; so that the necessary surgical care can be rendered and the healing process started without undue delay.

During the time of examination and treatment it is essential that the surgeon draw out from the injured person a full and complete first hand story of the accident and its causes. If a proper confidence in the medical department has been built up, this description could be secured easily and freely, and will form an accurate basis for further investigation as is deemed necessary. Careful attention should be paid to the physical conditions and characteristics of the patient with a view to making notations on any and all points that might have a bearing on future handling.

All this information should be written immediately on the surgeon's report, in duplicate, one copy to be retained in the medical department for its file; the original being sent to the department handling compensation. It has been found desirable to have a printed form, to be filled in duplicate, notifying the department and a foreman's report covering the accident from his viewpoint. The duplicate copy, pinned to the original copy of surgeon's report which is sent to the compensation department, would seem to be a check against failure to return foreman's report promptly.

The foreman's report should stress two important points—"How did the accident occur?" and "What can be done to prevent a recurrence?"—together with other information that is deemed necessary and advisable.

The compensation department should check carefully on the surgeon's report and the foreman's report, noting all discrepancies, and make such further inquiries as are necessary to make the stories match and present a clear and complete picture of the facts.

Roughly speaking, injuries might be classed under three general headings: First, those injuries which require only the original treatment and dressing (or subsequent dressings) and do not involve stoppage of work; second, those cases which are returnable to work but can return to the medical department for treatment; third, those cases which require confinement to the home or hospital. The first two classes should be assigned a definite time to return for treatments and a record kept to check against failure to return as suggested. The third class should be followed through by the medical department for treatment as required. A progress report should be made out after each treatment, visit or dressing so that the compensation department is properly advised as to the situation in each individual case.

In cases where the recovery from the injury is delayed beyond the point where a full recovery can be normally expected, such additional tests and examinations should be made to positively determine that there are no contributing causes, other than the injury itself, for failure to respond to the usual treatments indicated.

Somewhat the same procedure should be followed in those cases where it is suspected that malingering is delaying the recovery unnecessarily.

The compensation department—with these various reports before them, together with such personal investigations as may be required—should be able to handle those cases, which are of a partial permanent nature, or involve specific losses, or those compensable cases which are returnable to work after a period of treatment, with the proper knowledge of each situation. Usually, this should be a matter of simple computation.

The laws governing the payment of compensation to injured employes vary to a considerable extent in the different states. Some states make it necessary that hernias, for instance, be of such a nature as to cause stoppage of work completely and be due entirely to the work in which the injured person was engaged. Other states insist on the payment of compensation for this class of injury when the nature of the work may or may not have exaggerated or aggravated a previous existing condition.

Other causes under some state laws throw the entire burden upon the employes, while other states are more liberal in their interpretations. Each set of circumstances must be considered as

*Presented before the National Safety Congress.

a separate matter, as to what is or is not compensable, depending upon the laws of the state in which you are operating or in which state your employes may be when injured.

Working in conjunction with the medical and compensation departments, the safety department should check carefully on the records of injuries and causes and take such immediate action as may be possible to correct the accident producing causes.

It is recommended that a plant safety committee, composed of both supervisors and workers be organized, and to this body should be brought the composite record of injuries and causes. As a means of enlisting the active cooperation of the plant personnel and spreading the gospel of accident prevention this system has proven its worth.

Regular inspection trips should be planned for the committee and the results of each trip should be sent to the superintendent of the plant in order that a complete follow-up may be had. If your operations cover more than one plant, the accident records and accident prevention records should be compiled jointly, so that each location will have the advantage of the experience gathered.

Much more could be said as to the value of records and statistics in carrying on safety work and the information to be gained by careful checking through the accident reports which are constantly passing over our desks. But as the subject assigned to me was the "Routine of Handling Injuries" and it is my understanding that speakers to follow me will cover these points, I feel it would be unfair to those men who have spent time in preparing their talks to steal their thunder.

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## Manufacture of Potassium And Calcium Chloride

In the State of Utah are many deposits of low-grade lead-silver ores whose metal content could be recovered by applying the chloridizing roasting and brine leaching process. However, when this process is applied to the treatment of such ores, soluble sulphates are formed during the chloridizing roasting, and these soluble sulphates greatly lower the solubility of the lead when the roasted ore is leached with a brine solution. Therefore, the problem which presents itself, in connection with the application of this process to such ores, is to remove the sulphate radical from the solution during brine leaching of the roasted ore. As a result of experimentation by the Intermountain Experiment Station of the United States Bureau of Mines, Salt Lake City, Utah, it was found that this radical could be successfully removed by the addition of calcium chloride to the brine leaching solution, as it causes the calcium sulphate to be precipitated out from the solution. However, as the market price of calcium chloride is about $40 a ton, it is not commercially feasible to use this reagent at that price for removing the sulphate radical from the brine solution.

It is estimated that calcium chloride could be produced from salt, sulphuric acid and limestone for approximately $35 a ton, but this cost is also prohibitive so far as the use of calcium chloride as a reagent is concerned for the purpose above indicated. As a result of this experimentation a method has been worked out whereby the calcium chloride can be produced by heating salt, silica and ferric oxide to 850° in the presence of steam. The hydrochloric acid vapors evolved can be fixed as calcium chloride without taking any precautions during the condensation to diminish the amount of moisture. The success of this process depends largely on the mechanical behavior of such a mixture of siliceous material and salt, and on the concentration of the calcium chloride obtained. Special attention is now being given to these phases of the problem.

The commercial production of cheap calcium chloride would admit of the chloridizing roasting and brine leaching process being applied not only to the treatment of low grade lead silver ores but also to blast furnace flue dust. At present this flue dust is returned to the furnaces, which not only diminishes the useful capacity of the furnace by giving it a high circulating load, but also reintroduces the volatilized impurities. The production of cheap calcium chloride would permit a leaching process for the treatment of this flue dust.

In connection with the application of the chloridizing process to the treatment of ores, it is possible to form valuable chlorides other than those of the metals, as for example, potassium chloride. This chloride is of especial value as a fertilizer in connection with the sugar beet industry. Hence, the work which has been done on this problem should be of benefit not only to the mining industry but to the agricultural industry as well.

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## Compressed Air Society Revises Trade Standards

The Third Edition of its "Trade Standards" pamphlet has been published by the Compressed Air Society and may be had upon application to the Secretary, C. H. Rohrbach, No. 90 West Street, New York City.

It has been considerably enlarged and improved, comprising 47 pages in 8½ inches x 11 inches size, with numerous illustrations and tables that will be of assistance in the treatment of various compressor problems.

New material that has been added includes a description of the A. S. M. E. standard air receivers with list of standard sizes of these receivers; pneumatic tool standards; and a section on portable compressors.

# BARGE TRANSPORTATION INCREASES ECONOMY FOR KING'S CROWN PLASTER COMPANY

THE plant of the King's Crown Plaster Company at Cedar Rapids, Iowa, presents some unique features that are both unusual and interesting. One of the most uncommon is the method of recovering sand and gravel from a pit by dredging in the Cedar River and floating the material down the stream to the washing and screening plant located at First street and I avenue in the west section of the city of Cedar Rapids. This is added to the fact that it is one of the oldest operating companies in the Middle West, having started operations in 1888 and incorporated the company in 1903. The plant has been completely modernized up to and, at times, in advance of each period of rebuilding. The company has ever been awake to the advances of the sand and gravel industry from the scientific and mechanical knowledge extant as well as on the alert for a profitable outlet for the product to meet the changing and imperative demands of modern building progress. Among the materials manufactured are wood fiber and cement plasters, concrete exterior stucco and concrete building blocks, besides, for some time the maintenance of a wholesale and retail distributing center for almost all classes of building materials not manufactured.

For securing the raw material, a dredge boat is located on the Cedar River some distance from the screening and washing plant. It is of wood construction with a hull 20 feet wide, 70 feet long and 5 feet 8½ inches deep, carrying a cabin 15 feet by 57½ feet in area. For dredging, the boat is equipped with a 10 C Morris centrifugal pump with a 10 inch suction. It has manganese steel impeller, disc and throat liners. The boat carries a Morris 3 drum hoist, or 1 main drum and 2 pony drums, with the shaft extended on either side of the cabin and fitted with outboard bearings and a 2½ inch belt driven Morris pumping and general service pump. A 48 inch by 14 foot Telsmith jacketed rotary screen separates the fine sand and loads only marketable materials into barges. For emergency, the dredge boat is equipped with an 8 inch Morris centrifugal sand pump, ready for operation in case of a breakdown of the larger unit. Power for operating the dredging unit is supplied by a 100 h.p., 4 cylinder, heavy duty, Kahlenberg stationary oil engine.

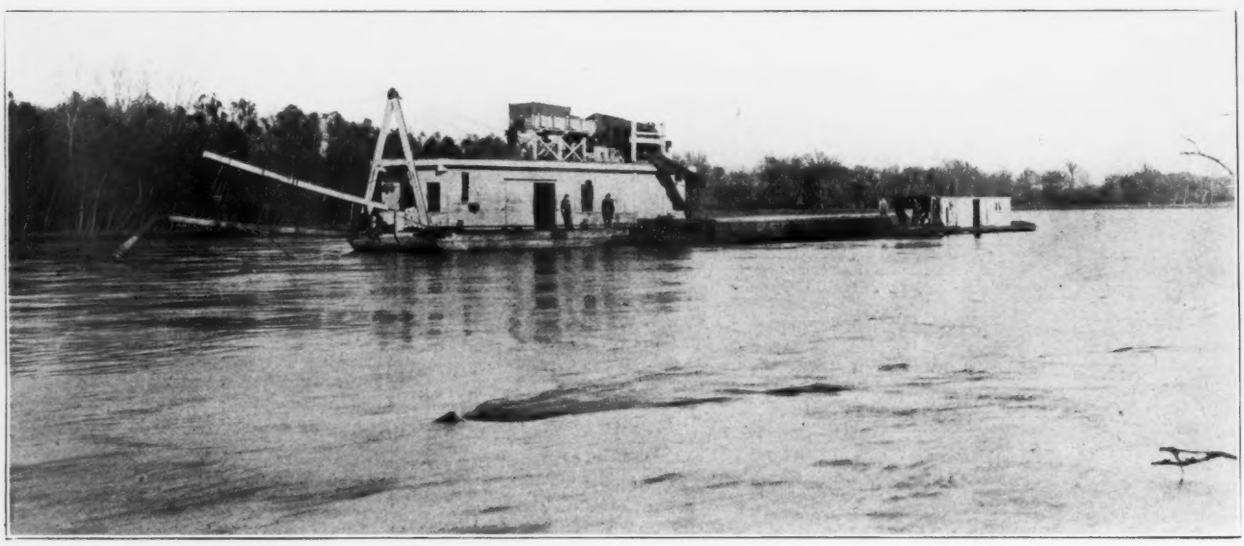
The sand and gravel is pumped from the bottom of the Cedar River onto one of the five barges operated on the river. These barges are each 18 by 80 feet with cargo boxes holding approxi-

Main Office of King's Crown Plaster Company.

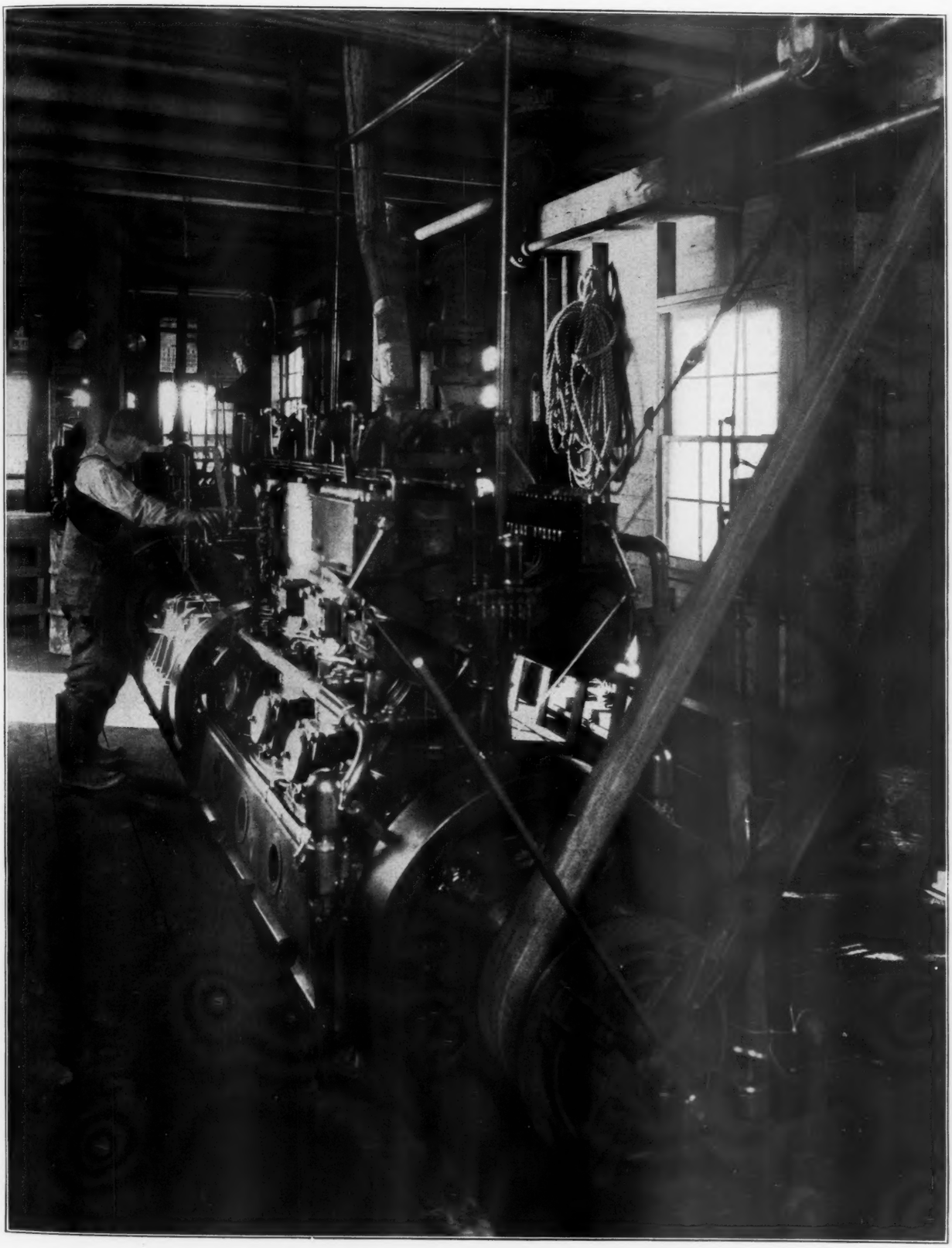
Unloading and Screening Plant, Hopper for Loading Trucks for City Trade and Derrick for Unloading.

mately 65 cubic yards. They are towed down the river to the plant by two power boats. One of the boats is 12 by 50 feet, equipped with a 60 h.p., 2 cylinder, Kahlenberg marine oil engine, and the other is of the same dimensions, driven by a 50 h.p., 2 cylinder Kahlenberg marine oil engine.

After the material is towed to the landing at the washing plant, the barge is made fast and unloading is begun. Unloading is almost continuous since when one barge is unloaded another one replaces it on the dock. The unloading plant is equipped with one double drum American electric hoist with slewing attachment and counterweight holding drum and banked levers, equipped with a 50 h.p. motor for operating the clamshell bucket; and one American wood stiff leg derrick equipped



Boat on which Is a Power Plant for Towing Material.



Interior of Power Room, Showing Engine for Operating Gener ator Set.

Plaster Mill and Small Part of Material Yard.

with a 16 by 16 inch by 40 foot mast, a 14 by 14 inch by 86 foot boom and a 16 foot bull wheel operates a 1¼ yard Hayward clamshell bucket.

As the material is unloaded by the clamshells, it is dumped from the bucket into a hopper and elevated to the top of the screening and washing plant. From here it is taken by a 20 inch by 5 foot Telsmith automatic plate feeder complete with steel frame and friction clutch and fed to the screens. One of these is a 48 inch by 14 foot Telsmith heavy duty scalping screen on a steel frame with a 10 foot sand jacket and the other a 40 inch by 16 foot Telsmith heavy duty washing screen complete with scrubbing section, sand jacket and gravel screening sections all mounted on a heavy lumber frame.

Water for the scrubbers and screens is supplied by a 4 inch Dayton Dowd centrifugal pump direct connected to a 20 h.p. motor. The pea gravel and 1½ inch sizes pass to their respective bins, while the fine sand for engines and plastering use and the coarse sand pass respectively into the Telsmith Number 6 and Number 7 automatic sand settling tanks. The sand then passes to the bins provided to receive it. The entire plant is operated by electric power and each unit is driven by a separate motor.

For primary storing and loading cars and trucks four bins, each 14 feet in diameter, are provided. These bins are equipped with Telsmith quadrant type bin gates with loading chutes for railroad cars and trucks and similar gates for loading the conveyors. One 20 inch heavy duty belt conveyor, with 73 foot centers, one 20 inch belt conveyor with 288 foot centers and one 20 inch belt conveyor with 57 foot centers, all of Telsmith design, are used to load cars and make stock piles.

Much of the material produced is loaded on railroad cars, as the plant has access to five railroads. Trucks, mostly Mack, owned by the company are used for making deliveries to accessible points. The product of the washing and screening plant consists of fine sand for engines and plastering and coarse sand, pea and 1½ inch gravel and material that conforms to highway specifications.

The company operates a cement block plant that is equipped with an 8 by 8 by 6 Ideal block machine, an Ideal Automatic tamper and a Blythstone paddle mixer. It has a mixing plant where it produces sanded wall plaster and neat wood fiber or hair plasters. Exterior stucco, which is marketed under the trade name Crowncrete Portland Cement Stucco is also manufactured on the property. The buildings in which the finished products are made are all located near the main plant, which is a factor in reducing the cost of the building materials produced.

Officers of the company are William King, president; J. W. Pichner, secretary-treasurer and manager; W. C. Crawford, assistant manager; and Frank Fonda, plant superintendent.

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## Wants Pit and Quarry

Tom B. Laird, of the Frisco Quarried Stone and Gravel Company, Jonesboro, Arkansas, appends the following to his subscription renewal: "Certainly would not be without Pit and Quarry."

# ILLINOIS SAND AND GRAVEL PLANT SOLVES WASTE SAND PROBLEM

THE H. P. B. Sand and Gravel Company of Rockford, Illinois, operates a plant 3½ miles south of that city from which deliveries are made entirely by truck for local trade. The property consists of 20 acres and is on State Highway No. 2, which runs from Rockford to Dixon. A concrete brick plant is also operated in connection in which all of the waste sand is used. The sand and gravel plant was built in 1921 and has a capacity of about 200 yards per 10 hour day, of which the brick plant uses about 25 yards. The brick plant has turned out as many as 14,000 brick in five hours. An unusual method of stock-piling is also used.

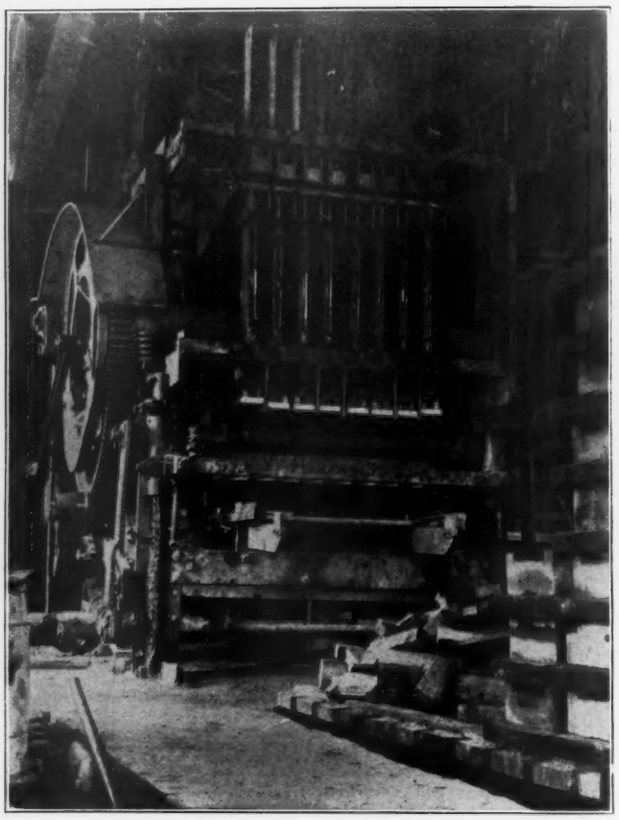
The sand and gravel is excavated from the pit by a 500 foot span slack line cableway excavator with a ¾ yard Sauerman bucket and dumped into a hopper at the top of the plant. Leschen cable is used throughout, the cableway being 1¼ inch, the head line ¾ inch and the tail line ⅝ inch. The tail end of the cableway is fastened to a dead man and the head end to the top of a 75 foot wooden mast which is braced with Sauerman cable guys.

The hoist house is located at right angles to the line of operation and to the south of the plant. A Sauerman 2 drum hoist operates the cableway. This hoist was originally steam driven, but when the plant was electrified a G. E. 75 h.p. motor and controller were installed.

View of Storage Yard.

The hopper on top of the plant discharges by a reciprocating feeder with a capacity of 20 cu. yds.

Main Plant Building and Slackline Cableway.



Concrete Brick Machine.

per hour into a water box washer and then into a 4 by 16 foot Galena Iron Works rotary screen. The screen is belt and spur bevel gear driven by a G. E. 7½ h.p. motor which also drives the feeder. The screen is in three sections, the first five feet being blank, the second, six foot, section having 9/16 inch and the last, five foot, section 1½ inch perforations. A five foot diameter sand jacket over the six foot section has three feet of 3/16 inch and 3 feet of ¼ inch perforations. A spray played upon the 9/16 inch section gives the material additional washing.

The oversize from the 1½ inch section is chuted to a Universal 8 by 16 inch jaw crusher and reduced to 1½ inch. It is then fed to a gravity screen with 9/16 inch mesh which rejects the fines. This screen is a home-made affair and is belt driven by a G. E. 5 h.p. motor. The oversize from the gravity screen is then dumped into the same bin as the 1½ inch stone from the revolving screen and the rejects go to the pea gravel bin.

The sand from the revolving screen goes to two Good Roads sand settling tanks, one for the fine and one for the torpedo sand, and into separate bins. A gate under the receiving hopper is so constructed that when bank run gravel is wanted the material is by-passed directly into another bin. This material runs about 60 percent sand and 40 percent gravel and is used mostly for road work.

Trucks are loaded from gates under the bins and either deliver direct to the consumer or deposit the material in stockpiles. The trucks are run upon ramps, of which there are two, and dumped into a hopper at the end of the ramp which feeds a

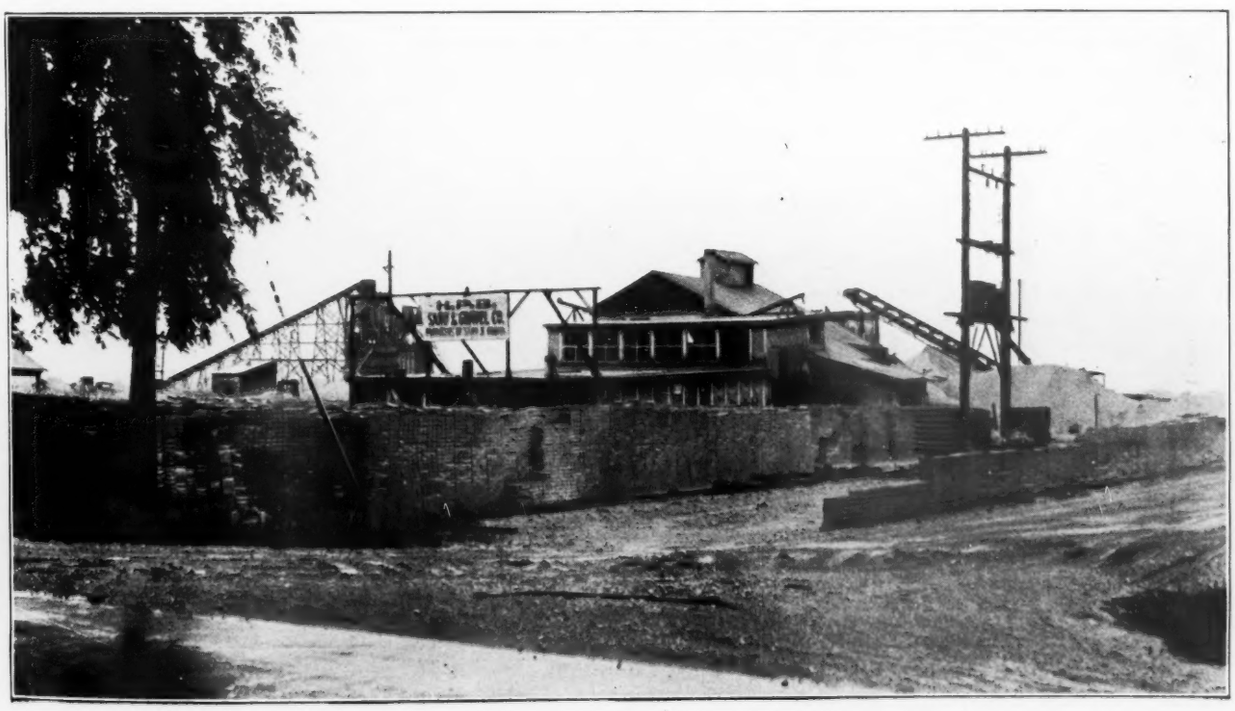
Plant from Southeast Showing Cableway Lowered for the Night.

Truck on Ramp Feeding Stockpiler.

Barber-Greene Model N 60 foot stockpile loader. Each ramp has a semi-circular runway around it on which the wheels of the loader run, making it possible for one man to move the loader about its pivot and for two men to move it from one ramp to the other. The east ramp is being used to store the 1½ inch stone and the west ramp for fine and torpedo sands. Loading from the stockpiles back into trucks is done by a ½ yard crane.

The torpedo sand is piled up against a concrete wall which forms the east side of the brick plant. A gate at the bottom of this wall feeds the sand to the feeder of the brick machine. Pea gravel is loaded by the Barber-Greene into a hopper on top of this wall which discharges into a measuring box and into the same feeder.

This feeder discharges into a 14 foot Besser mixer and a hopper beneath the mixer feeds a Besser brick making machine which makes 8 brick per pallet. A G. E. 15 h.p. motor drives all of these units. The brick are removed to a steam curing room where they remain for 24 hours in an average temperature of about 95 degrees F. They are then piled into the storage yard and delivered by trucks.



Brick Storage Yard with Building in Right Background.

A storage shed with a capacity of 300,000 brick is used to store brick for winter use.

The brick produced has been used for theaters, office buildings, factories and garages, and underground work such as sewer manholes. Rather exhaustive tests of these brick have been made and have resulted in economies of production and improvement of the product. Formerly 146 brick were obtained from a sack of cement and seven cubic feet of sand. Now 192 brick are made from one sack of cement, seven cubic feet of sand and three cubic feet of pea gravel. Tests made in cooperation with the Service Bureau of the Universal Portland Cement Company and the Materials Testing Laboratory of the Lewis Institute in Chicago show an average compressive strength of over 3,000 pounds per square inch.

Water for washing the materials and other uses comes from a sump in the pit and is pumped by a single stage centrifugal driven by a 15 h.p. G. E. motor. The washing water is flumed back into an abandoned section of the pit after it is used. A transformer on the property reduces the power from the public service wires down to 200 volts. R. Leach is superintendent and runs the producing plant with the aid of an engineer and helper. Five more men are employed in the brick plant.

A material yard where all kinds of building materials are handled is maintained at 2117 Kishwaukee Avenue in Rockford, where the offices of the company are also located. Verner L. Page is president and general manager and G. Philip Holm is secretary and treasurer of the company.

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## Chemical Engineers Discuss Problems of Interest

A group of the leading professional consultants, representatives of all branches of chemistry and chemical engineering, recently met at the Chemists' Club in New York to perfect the organization of the Association of Consulting Chemists and Chemical Engineers.

Dr. Alexander O. Gettler emphasized the importance to the public of the following points in the Code of Ethics: "Every individual on entering the Association of Consulting Chemists and Chemical Engineers, and thereby becoming entitled to full professional membership, incurs an obligation to advance the science and art of chemistry and chemical engineering, to guard and uphold its high standard of honor, and to conform to the principles of professional conduct. He shall refrain from associating with or allowing the use of his name by any enterprise of questionable character. If in his opinion, work requested of him by clients seems to present improbability of successful results, he shall so advise before undertaking the work. He shall be conservative in all estimates, reports, testimony, etc., and especially so if these are in connection with the promotion of a business enterprise. He shall be diligent in exposing and opposing such errors and frauds as his special knowledge enables him to recognize."

Assisted by Dr. Louis P. Hammett in discussing the report of the Committee on Constitution, the objects of the organization are: "By all proper means to advance the science and practice of consulting chemistry and chemical engineering; to further the service of the profession of its clients, to the public, and to all branches of the Government; and to promote friendly intercourse and cooperation among its members so that their welfare be furthered, and the highest ethical standards of the profession be maintained."

During the discussion of the proposed Constitution, Dr. D. P. Morgan, Jr., said: "In order that American industry may maintain its leadership in this chemical age it should have the unstinted assistance of every branch of the important profession of chemistry and especially the consultants. Such cooperation, I believe, can best be made available by united effort efficiently directed and we, the consulting chemists of our country, should and, in my opinion, will earnestly strive to aid through the medium of organization the ever growing number who are more and more realizing that American supremacy can best be upheld through the creative possibilities of modern chemistry practically applied and expertly directed."

"The reason industrial progress in Germany has been so rapid," said Dr. Alvin C. Purdy, "while no doubt partly the result of constant and thorough application is, nevertheless, largely due to the fact that over there they constantly draw upon chemical engineering knowledge for help in every kind of industry, while here many of our business men are still under the spell of the delusion that chemistry is only helpful where chemicals and drugs are concerned. As a matter of fact many of our alert business men now realize the versatility of the Chemical Engineer who perfects old and creates new materials; who selects the most efficient equipment, recommends better and less costly raw materials, and simplifies processes. It is he who turns waste nuisances into profitable by-products and it is his advice that is more and more being sought and relied upon not only by industrialists but also investors and bankers."

Others who spoke were: Louis O. Bergh, Russell Raynor, Irving C. Bull, Henry E. Cutts, Ludwig Saarbach, Joseph Geisler, Harry P. Trevithick, Clarence P. Harris, George H. Walden, Jr., and Emil Schlichting.

The following officers were elected: President, Hal T. Beans, of Columbia University,; vice president, Irving Hochstadter, of Hochstadter Laboratories; secretary, Clarence V. Ekroth, of Ekroth Laboratories; and treasurer, Jerome Alexander.

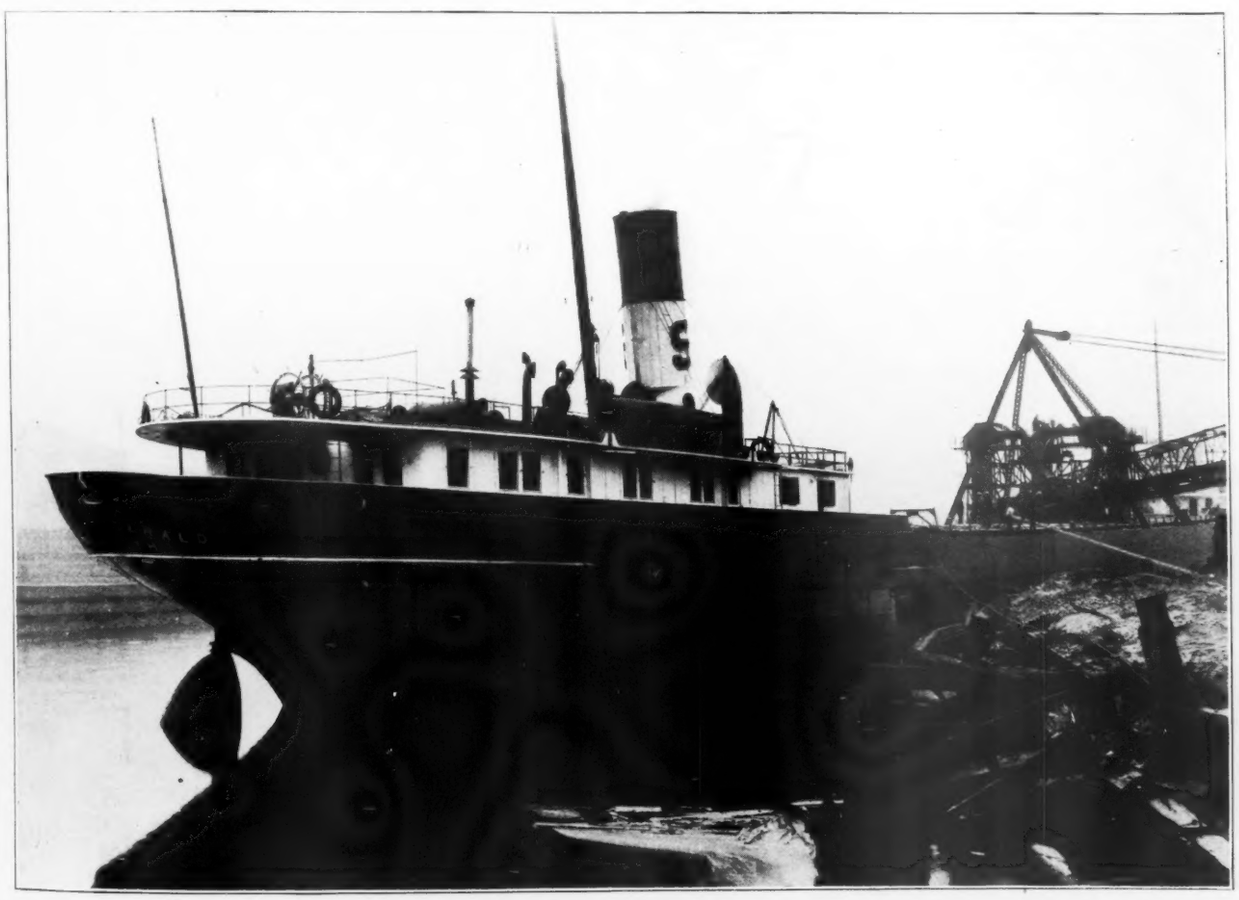
# NEW SELF UNLOADING BOAT IN OPERATION BETWEEN GREAT LAKES PORTS

THE Pit and Quarry of August 15, 1928, carried an article on self unloading boats for handling crushed stone, sand and gravel, cement, coal, etc., which described the various types in use at that time. Mention was made of the boat Fitzgerald which was then under construction by the Webster Manufacturing Company for D. Sullivan and Company. This boat has since been completed and is now in operation.

The Fitzgerald is very similar to the boat Sand Merchant, also constructed by the Webster Manufacturing Company, which was described in the previous self unloading boat article. It is, however, a much larger boat with greater cargo capacity and for this reason the equipment was designed to handle the material at a more rapid rate. The Fitzgerald will unload 800 tons of sand per hour as compared to 400 tons by the Sand Merchant. Also the Fitzgerald uses only one bucket elevator conveyor where two are used on the Sand Merchant.

The Fitzgerald before its conversion was a regular freighter in the service of its present owner. It is 440 feet long overall, with a beam of 52 feet and a storage hold 287.5 feet long. Material was loaded and unloaded into the hold by dock equipment through 23 hatches, each 9 feet wide and 36 feet long, spaced 12.5 feet center to center. Its capacity of 8,000 tons, 60 tons per inch of draft, has been unchanged for heavy materials such as sand, while for lighter materials which occupy more space the capacity has been decreased less than 8 per cent due to the installation of unloading machinery. No changes have been made in the hold or hatches except that several of the hatches at the center of the boat where the unloading mechanism is located have been eliminated. The change in the center of gravity of the boat due to its conversion is so small as to be negligible.

The Fitzgerald is now operating between all Great Lakes ports although up to this time trips have been made mainly between Muskegon, Cleveland, Port Crescent, Detroit, Ashtabula, Milwaukee and Racine. Wet sand and coal have been the only cargoes handled but it is also planned to handle crushed stone. The boat has a crew of 34 men all told, only six of them being needed to operate the unloading equipment. These include a superintendent, a conveyor man and four operators and oilers.

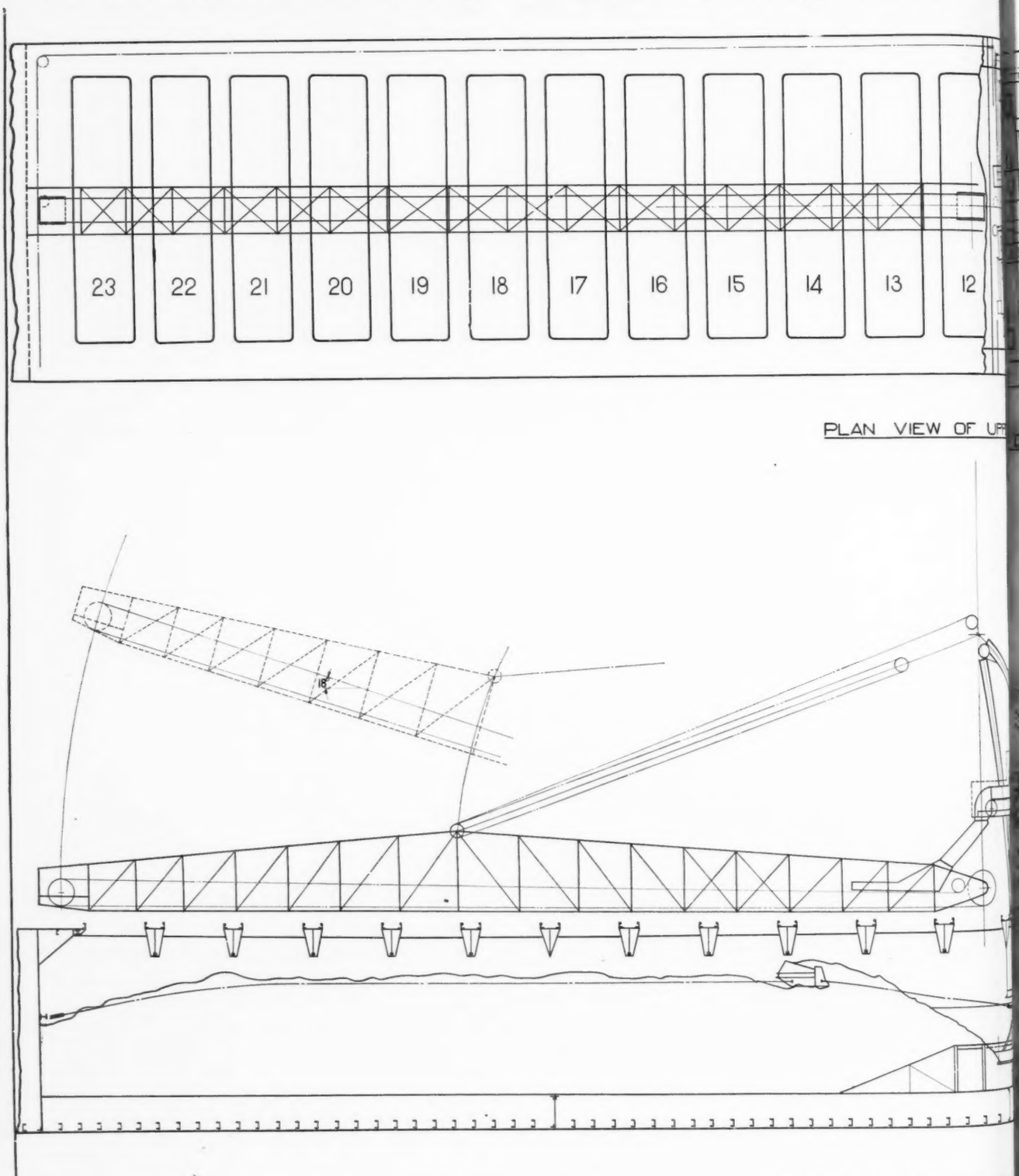


The Fitzgerald at Dock Unloading.

The material is fed from both ends of the hold by two Sauerman 4 yard Crescent scrapers each driven by a 125 h.p. Clyde Iron Works steam hoist located under the deck. The tail sheaves on the scraper systems are movable, allowing the boat to be thoroughly cleaned out by the scrapers. The scrapers discharge onto three sets of feeders 2 feet 6 inches wide feeding the material from both sides into the conveyor buckets. The feeders are chain driven from the corner shafts of the elevator.

The elevator conveyor runs horizontally through the hold receiving the material from the feeders and conveys it up the side of the boat and back above deck to the center of the boat where it is discharged. The empty conveyor travels down the other side of the boat back into the hold. The buckets, which have manganese steel rims, are 60 inches long, 30 inches wide and 20 inches deep. The elevator is driven by Diamond Chain Company chain drive from a Clyde Iron Works 185 h.p. horizontal steam engine located on the deck.

The bucket conveyor discharges onto a feeder

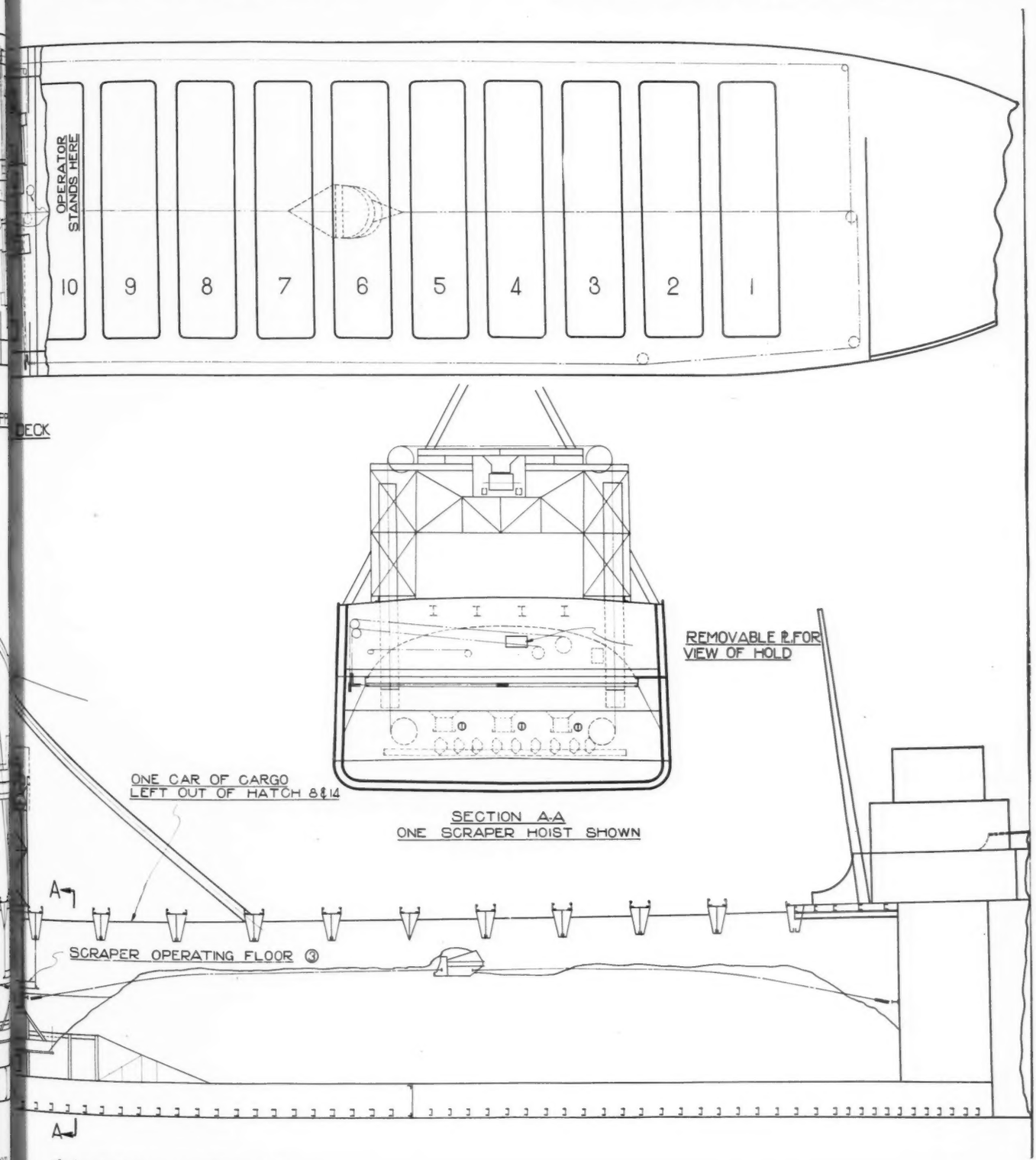



Plan View and Vertical Section

belt conveyor 42 inches wide and 12 foot centers which in turn discharges through a chute onto the boom belt conveyor. The feeder belt is driven by chain and gear from the same engine as the elevator.

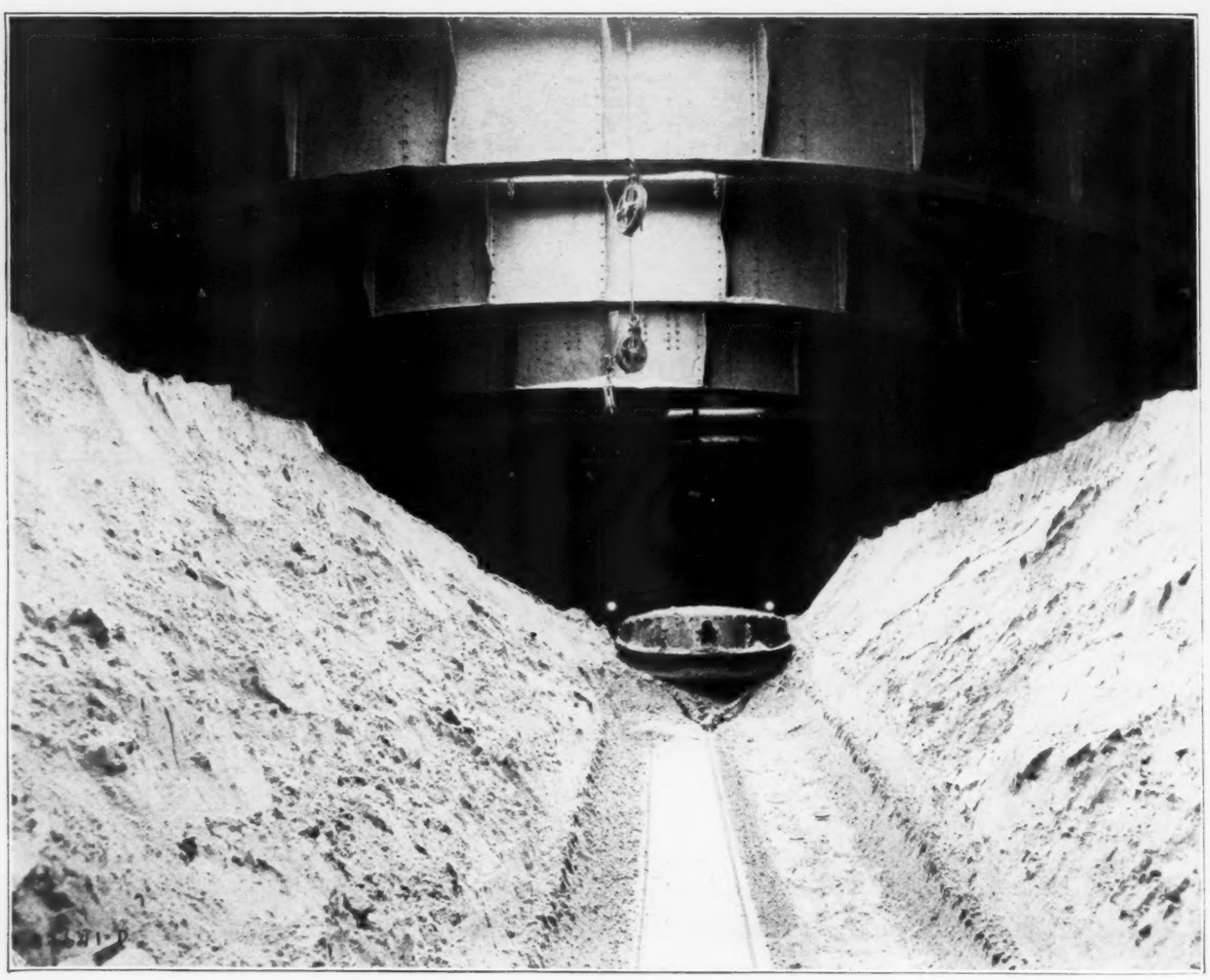
The boom belt conveyor is 42 inches wide, 140 foot centers, and has a linear speed of 300 f.p.m. This conveyor is driven at the tail pulley by spur gear onto two sets of bevel gears at the pivot point of the boom from the same engine as the elevator and the feeder conveyor.

The boom supporting this conveyor is a structural steel truss swinging on a pivot and supported at its center by 20 cables from a structural steel A-frame at the center of the boat. Back-legs extending toward the front of the boat give rigidity and strength to this support. Raising and lowering of the boom is accomplished by this 20 strand ¾ inch wire rope tackle operated by one drum of a two drum steam hoist on the deck level well in front of the pivot point. The other drum of this hoist controls the horizontal swing of the boom.




of the Self Unloader Fitzgerald.

View from After End of Boat, Showing Conveyor Discharging.



Drag Scraper Hauling Material to Bucket Conveyor.

Closeup Showing Unloading Machinery and Boom Arrangement.

Each of these drums has a clutch allowing it to be operated independently of the other. Horizontal movement is accomplished through four 12 inch snatch blocks, two mounted on each side of the ship at the deck, two 12 inch single sheaves on the boom and two 12 inch single swivel blocks mounted on head posts at the edges of the deck forward of the pivot point.

The boom can be elevated to an 18 degree angle and will operate in a horizontal circle of about 185 degrees. When in place for a voyage the boom has a two foot clearance in front of the rear deck structures and a six foot clearance above the deck. The swinging end is rested on horses and firmly strapped into place to prevent any movement.

All of the equipment was made by the Webster Manufacturing Company with the exception of the Sauerman scrapers and the Clyde Iron Works hoists and engines. Steam for all operations is furnished by the main boilers of the boat.

## Enjoys Pit and Quarry

H. M. Gilbert, of Denton, in a letter to the editor states: "I enjoy Pit and Quarry," and appends the information requested.

## Mississippi Valley Association To Discuss Problems

The Mississippi Valley Association will hold its convention at St. Louis, November 26th and 27th.

The Statler Hotel will be headquarters for those attending.

The representatives from all the great interior states meet to consider further development and utilization of our natural waterways.

Secretary of War Dwight F. Davis, Major General Edgar Jadwin, chief of Army Engineers, distinguished senators and congressmen, and prominent citizens will be on the program to discuss progress made and plans to continue improvements of our nine thousand miles of interior waterways. President elect Herbert C. Hoover has been invited to address the convention.

The Illinois River Division of the Mississippi Valley Association will entertain the delegates from Illinois at luncheon, November 26th, to discuss the progress made during the year in constructing the Illinois link of the Lake-to-The-Gulf system.

# DEVELOPING A SAFE HUMAN FACTOR

By L. A. Hartley*
Director of Education, National Founders Association, Chicago, Illinois.

SAFETY is a direct result of constructive thinking. Constructive thinking is a result of progressive experience. As science is an orderly arrangement of facts, so safe conditions are the evidence of orderly habits. "As a man thinketh, so is he." Shiftless thinking always accompanies shiftless actions. Unsafe thinking always results in unsafe conduct. The supreme task of the safety engineer is to lead workers to think constructively. When workers and employers "think safety," workers will be reasonably safe. These are well-known facts and every safety operator is acquainted with them. These statements may be said to be fundamentals of the great safety movement.

A fundamental is a principle upon which all normal individuals agree. For example, normal persons agree that one must eat, that sufficient clothing should be worn, and that mankind should have adequate shelter. These are known as the fundamentals of physical life. Normal persons agree upon marriage as an institution, recognized government as a means of social organization, and observance of law as an aid to order in community life. These are known as fundamentals of social life.

Persons of regular habits of thinking agree that industrial organizations as we know them, organized trade and commerce, and our present systems of manufacture and distribution are effective means of progress which have been developing since history was first recorded. These are fundamentals of production and distribution.

Occasionally persons are found who disagree with the opinion of the majority. Occasionally some one conceives the idea that eating is unnecessary or that clothing and shelter are unessential. These persons are objects of ridicule or sympathy. As long as their peculiar mental attitudes do not interfere with the comfort or safety of others, they are allowed to remain at large. Whenever a person or a group of persons actively ignores an accepted fundamental, such person or group is deemed to be a menace to the welfare of organized society and immediate measures are taken to restrain that individual or group.

Since safe thinking is generally known to be fundamental to safety, the real question is how to promote safe thinking. It is with this question that this discussion is concerned. All regular persons believe that sound thinking leads to safe operation, and they want to know how to get people to think safety.

Since a fundamental of safety is that the human factor must be guided into safe thinking, it follows that those who are directly responsible for safety organizations should know at least as much about human beings as persons who operate and maintain equipment are expected to know about this equipment.

This is all the more important since it is commonly understood that there is no such thing as a perfectly safe man. Equipment is designed to perform certain operations; and before it leaves the factory where it is produced, it is thoroughly tested to insure its performance. No such complete test is applied to workers. Indeed, it is questionable as to whether tests can be devised which will reveal the full extent of human possibilities.

Safety is a relative term. Production must be carried forward if human beings are to live, and every operation carries with it the possibility of danger. The inexorable fact that all human activity incurs a relative risk is the reason for continuance of safety programs. In the absence of dependable tests regarding human beings there is only one course of procedure which promises success. Human beings must be trained for safety; and before training is begun, those responsible for this training must study the whole situation of which safety is but one of closely associated parts.

The first great fundamental of industrial safety work is that improved measures of safety always result in improved production. Mr. L. A. DeBlois, in his "Industrial Safety and Production," has well said, "Safety and efficiency are unquestionably linked together." Industrials who tolerate unsafe conditions are agents of inefficiency. In other words, efficient production and distribution and safe working conditions go hand in hand.

Sidney J. Williams, in "Waste in Industry," comments strikingly on this phase of the subject: "A piece of material falls off a truck and injures the workman's foot. We call this an accident and we know that it results in an economic loss. But there are other times—perhaps a hundred or more—when a piece falls off the truck but does not happen to fall on the workman's foot." This is the heart of the great safety program. Safety in industry is irrevocably linked up with every other industrial problem.

When industrial leaders understand that safe working conditions promote efficiency they appreciate the second fundamental which is that those working conditions under which the average man does his best work are also the safest conditions.

*Presented before the National Safety Congress.

The development of a safe human factor becomes therefore a matter of general development of production environment.

In the language of Dr. Harry Myers, of the Frigidaire Corporation, "It has been demonstrated that a healthy, happy, contented worker is a better worker than an unhealthy, unhappy, discontented worker," and it is just as accurate to say that a healthy, happy, contented worker is a safer worker than an unhealthy, unhappy, discontented worker. If this fundamental is accepted, the way is opened for a broad constructive program which should interest not only the specialist in safety but should stir the imagination of every type of industrialist.

What are the things that promote health, happiness, and contentment in production? Of all the reasonable answers that might be given to this question there is one upon which all thoughtful persons will agree: Genuine interest in the work at hand will do much to promote health, happiness, and contentment. How may this interest be developed?

No man is safe who is not interested in his work. A high authority has stated that "A double minded man is unstable in his ways." No man can be safe and be out of sympathy with his co-workers or his employers. The blame for this lack of interest should not always be placed at the door of the worker.

Too often employers have endeavored to purchase the interest of workers by distribution of Christmas turkeys and prizes for the observance of rules and regulations. Such a system of open rewards, which is usually accompanied by punishments for violations of the code, cannot be expected to appeal to the higher type of employe who wants to do right for the sake of being right. The whole idea of reward and punishment as a means to promote production and distribution is based upon the principle of coordination. Cooperation must come from within. Cooperation cannot be enforced. There are great possibilities in rewards intelligently given but considerable harm may result from too open reward for services and cooperation which should ordinarily be expected from employes.

All that needs to be done to secure the interest of normal workers is to practice exactly the same neighborliness with workers that is practiced in the neighborhood and in the home. Personal neighborliness is not possible in the case of busy managers who seldom have opportunity to meet workers. Their friendship must be reflected. One difficulty sometimes observed in modern industry results from the lack of adjustment to new methods. The old-time machine was a two-wheeled affair—the manager and the worker working side by side. Then the manager rolled around to the front office and the foreman was placed on the main axle opposite the workers.

These three groups are as fixed by circumstances as are the wheels on some powerful three-wheeled truck. The manager gives the directions and the foreman and workers respond. As industry has grown, many other intermediate wheels have been introduced under different names—personnel, welfare, education, safety, medical service, pension plans, housing programs, and others too numerous to mention.

Every one recognizes the value of this additional industrial equipment, but there is ample reason for the belief which is rapidly growing in industry that the foreman should be given more responsibility in the general plan. Foremen should be given a larger share in all personnel activities. One factory has been highly successful in having the foreman assume direct responsibility for all personnel work. Instead of referring workmen of his departments to the personnel department for loans or other assistance of this nature, the foreman takes such matters up with the personnel superintendent who decides in the light of the foreman's recommendation. The management of this plant has let it be known that foremen are responsible for maintaining agreeable relationships in their departments. If production falls off or unusual accidents occur, these foremen look to home conditions as well as to plant conditions. It is assumed that worry over home conditions such as sickness, unfortunate financial situations, or accumulated bills may be reflected in production. This plant has a very active safety department. Its employment department is even more energetic than most, for it works both ways. It selects men for the plant and endeavors to find work elsewhere for every applicant who is good enough but who cannot be placed in the plant.

Men are not urged to observe safety regulations as a means to their own protection. Instead, there is a continual program of training designed to interest employes in their work and in the business. Along with this interest-arousing campaign is a consistent program of education the aim of which is to acquaint every one in the organization with such information as will make it easier, cheaper, or more interesting to perform the various operations necessary to the manufacture and distribution of their products. Safety rules are presented as operating information, together with methods of performing various jobs.

The system of rewards in this plant is interesting. Punishment seems to have been overlooked except as it may be recognized in the absence of reward. Apparently foremen are not on the lookout for violations of rules. On the other hand, they are constantly on the lookout for unusual achievements and the moment a worker is known to have demonstrated unusual interest in any kind of activity which will make it easier, cheaper, or more interesting to produce and distribute the products of the plant, he is marked up for a suitable record.

These rewards are not always material. Neither are rewards announced.

Everything in this connection is done very quietly. The foreman confers with the personnel superintendent and department heads immediately interested. The first aim of this conference is to decide, if possible, the kind of reward that would be most satisfactory to the one who has earned it. In one case, it may be advancement to another job; in another, it may be a few days off on pay to go hunting or fishing.

In one instance, a man who had proved himself unusually interested and cooperative was advanced funds for the purchase of a small grocery store which a member of his family operated until it was sold at a neat profit. This man simply was asked by his foreman to go to the office of the superintendent of personnel where he was told that it was understood that he wanted to buy the little store. When the information was confirmed, the man was informed that the company would advance the money to make the purchase. This seemed to be quite acceptable, and the loan was made returnable by installments from his wages. After the loan was completed and the company representatives had advised regarding the details of the purchase, the subject of the unusual service which led to the reward was casually mentioned and the workman was given to understand that such cooperation is appreciated.

The methods pursued in this plant are cited merely as examples of the application of fundamental principles to plant operation. The plant has an excellent safety record. Many companies duplicate certain methods followed in this plant and the general principle of human development as a means to safety is well understood. This example is cited because in this particular plant there is a systematized program based upon fundamentals of human development.

The third great fundamental which should govern all programs of human development is that human progress is a result of reasoning in given situations. Safety cannot be promoted to any great extent without taking steps to insure that those who are to improve conditions reason upon the need for improvement.

Man is distinguished from the beast by his capacity for reasoning. A man's mental activity marks his degree of intelligence. The progress of the race has not depended upon the strength of the bodies of men nor upon the memorization of rules. Progress has depended upon the strength and activity of the minds of men in connection with the skill of the human hand. The brains and the hands of a race indicate their relative development. Developed brains and skilled hands are associated in gaining increased control of environment. While man has developed but few really new ideas, beginning with the use of fire and of the continuous lever or wheel, he has gained control of many of the scattered details of a planet, he has assembled the ocean liners, the thundering locomotive, and the marvelous structures and inventions of our civilization.

Safety programs, like all other human activities, are dependent for success upon obedience to natural laws. There are many such. Only one will be mentioned as an example of another application of fundamental information.

One of the many natural laws which apply to safety programs is that of action and reaction. Every action is inevitably followed by its corresponding reaction. If fear or other strong emotion is used to stimulate man to act above his usual performance, he can be depended upon to descend in his effort to a correspondingly lower level of achievement as soon as the inevitable reaction has set in. Safety programs which depend upon fear or other strong stimulants as interest factors, in reality accomplish little and eventually reduce the ability of workers to respond consistently to the requirements of safety.

The need for closer coordination of safety programs with every other industrial activity suggests that there should be a more specific relationship between medical departments and safety departments. It cannot be expected that foremen and leading workers will possess information which some one connected with every plant should know about human beings as such.

To illustrate the possibilities of understanding of special biological information by some one directly connected with safety development, two physiological facts will be used as examples: (1) The brain requires an adequate supply of blood in order to function normally. If the brain does not receive an adequate supply of the right kind of blood, the individual will not be normal in his thinking. (2) Directly related to this is the fact that ordinarily blood is distributed throughout the body according to the activities of different parts.

For example, a laborer who uses the large muscles of his back, thighs, shoulders and legs must have sufficient blood for those parts in order to rebuild the muscles. Furthermore, the blood must be of such quality as to insure the rebuilding process. Long ago Mosso demonstrated that carrier pigeons after long flights were less able to see clearly, and found their wings and breast muscles dark with blood while their brains were pale because of inadequate supply of blood. Many of the cases ordinarily known as fainting are simply the result of insufficient supply of blood in the brain. This may be caused by a number of things, but the fact remains that ordinary fainting is a temporary condition of insufficient supply of blood to the head.

Workers who perform hard manual labor cannot be expected to see every detail as clearly nor think

(*Continued on Page* 66)

# SEVERAL SMALL SAND AND GRAVEL PRODUCERS STARTING UP IN NEW JERSEY

By F. A. Westbrook

THE demand for unwashed sand and gravel in sections of New Jersey contiguous to Paterson and Little Falls is so great that numerous producers have started up in a small way in the Preakness section where there are large and excellent deposits. At the present time, these operations are producing on a small scale, but it seems probable that at least some of them will assume more important proportions in the not distant future. At any rate, the equipment which they use and the way in which they use it is interesting and in all probability the manufacturers find a market in such places which is not to be despised.

Among these small producers is Emil Grundler, whose family formerly owned the land where Richard S. Sowerbutt now operates a large pit in conjunction with his quarry, a few miles away. The land which was retained by the family was found to contain a good deposit and Mr. Grundler started working it less than a year ago. He and his partner have all the business they can attend to already and if they do more they will have to enlarge the scale of their operations. Now, with two White trucks, they are working night and day.

The only machinery which they have is a Portable Machine Company belt loader. The sod is stripped off by hand and the bank caved so as to slip down on the loader as much as possible and in this way a truck can be loaded in 12 minutes. Mr. Grundler and his partner load their trucks and drive them. Sometimes the gravel is screened through a stationary screen.

Trough Conveyor at Bank.

A short distance away is the pit, or bank of Stock and Bloom. This is on a considerably larger scale than that previously described. A contractor,

Stripping the Bank for Fills.

Truck Loader Working at Bank.

who is making a fill, has brought in an Orton crane and is stripping the overburden. Stock and Bloom have a Nelson truck loader which works from the bank as from a stock pile and a trough conveyor made by the Conveyor and Equipment Company. Both are gasoline engine driven.

Contractors in the neighborhood send in their trucks to carry off the material and there seems to be a use for everything produced. The ground is leased and paid on a royalty basis per load. Twenty-five to forty truck loads per day are sold in this way.

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(*Continued from Page* 64)

as accurately while doing this work as after they have rested and there is opportunity for diversion of the blood supply to their brains. Numerous experiments upon birds and other animals suggest that many of the industrial problems involving the human factor are due to a considerable extent to pale brains. This again suggests an approach to the problem of human relations in industry which should lead to understanding appreciation of the human factor as such. All sorts of questions arise in the wake of understanding of even one fundamental physiological fact like the circulation of the blood. What makes blood of good quality? What foods produce good, rich blood? What is the effect of worry and fatigue upon body-building processes? What is the effect of fear on the maintenance of a healthy body? To what extent do living conditions affect maintenance of bodily health? What about agreeable working conditions? These physiological facts point the way for new appreciation of the broader scope of medical service to industry.

To summarize: That method of procedure which assures the greatest number of workers thinking most constructively about their jobs is the safest method. When executives and foremen see the safety program from a broader angle than mere accident prevention, safety work will mean more to production. Since disinterested and untrained workers are unsafe workers, every effort made to develop workers along right lines is in the interest of safety and of production for human service.

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## British Fuel and Power Report

An important document in the field on fuel utilization and power generation has just appeared in the form of a report of the National Fuel and Power Committee, which has been investigating fuel questions for some two years. This committee was appointed by the British Board of Trade in August, 1926, under the chairmanship of Lord Melchett (then Sir Alfred Mond) "to consider and advise upon questions connected with the economic use of fuels and their conversion into various forms of energy, having regard to national and industrial requirements and in the light of technical developments."

Among the recommendations of the committee are included a suggestion as to the obtaining of more detailed information regarding industrial fuel consumption, the extending of research in various aspects of fuel utilization, and certain suggestions in regard to correlating the production of coal and the generation of electricity and the supply of manufactured gas. Brief reference is made to the progress in connection with low temperature carbonization of coal, and in the opinion of the committee there now appear to be several processes of low temperature carbonization entering the commercial stage.

The publication of the report of the National Fuel and Power Committee coincides with the opening of the World Fuel Conference in London, at which are represented some 47 countries, embracing every part of the world where fuel is a factor of importance. The question of extending the system of area gas supplies mentioned in the committee's report is to be dealt with at the fuel conference, together with a number of other subjects investigated by the committee. Particular attention will be given to smokeless fuel developments, which are, of course, closely connected with the development of low temperature carbonization processes.

## Record October Construction In the 37 Eastern States

New building and engineering work contracted for in the 37 States east of the Rocky Mountains during the past month was the highest October contract total on record, according to F. W. Dodge Corporation. Last month's total, $597,103,500 in amount, was 3 per cent ahead of the September, 1928, total, and it was 6 per cent over the October, 1927, total. The above figure includes about 91 per cent of the country's total construction and is segregated into eight districts which are reviewed below. When comparisons were made with the October, 1927 records it was found that the only district where there was a decrease was the Central West.

The October building record brought the total amount of new construction started in these states since the first of this year up to $5,724,047,600, as compared with $5,359,297,900 for the corresponding period of last year, the increase being 7 per cent.

Analysis of the October contract total showed the following outstanding classes of work: $239,691,900, or 40 per cent of all construction, for residential buildings; $148,696,500, or 25 per cent, for public works and utilities; $67,330,400, or 11 per cent, for commercial buildings; and $62,258,700, or 10 per cent, for industrial projects.

New contemplated projects as reported last month in the 37 Eastern States reached a total of $616,933,100. This was an increase of 18 per cent over the amount reported in the preceding month and a gain of 1 per cent over the October, 1927, total.

### Record October in New York State and Northern New Jersey

New building and engineering projects contracted for during the past month in New York State and northern New Jersey, amounting to $187,781,900, was the highest October contract total ever recorded in this territory. It was also the largest monthly total on record since December, 1926. Large contracts in the public works and utilities class and in the commercial buildings helped to make the above records. The increase over September of this year was 21 per cent and the increase over October of last year was 12 per cent.

Analysis of the construction record showed the following important items: $68,177,800, or 36 per cent of the total, for residential buildings; $66,657,300, or 35 per cent, for public works and utilities; $24,983,300, or 13 per cent, for commercial buildings; and $12,115,600, or 6 per cent, for educational projects.

During the past ten months there was $1,540,935,400 worth of new construction work started in New York State and northern New Jersey, being an increase of 8 per cent over the amount started during the corresponding ten months of last year.

Contemplated new work as reported last month in this territory reached a total of $151,491,000, which was a drop of 8 per cent from the preceding month and a loss of 19 per cent from the amount reported in October, 1927.

### New England States

New construction work started in the New England States last month reached a total of $41,435,200. This figure shows a gain of 44 per cent over the October, 1927, record, but there was a drop of 44 per cent from the September, 1928, total. Included in the October building total were the following: $17,173,700, or 41 per cent of all construction, for residential buildings; $10,322,800, or 25 per cent, for industrial projects; $4,085,400, or 10 per cent, for commercial buildings; and $3,539,900, or 8 per cent, for educational projects.

Last month's contract total brought the amount of new building and engineering work started in the New England States since the first of this year up to $436,720,000, as compared with a total of $338,666,900 for new building and engineering work started during the corresponding period of 1927, the increase being 29 per cent.

New contemplated projects as reported last month in this district amounted to $38,852,900. There were increases of 29 per cent over the amount reported in the same month of last year and of 28 per cent over the amount reported in the preceding month of this year.

### Highest October on Record In Middle Atlantic States

Construction contracts awarded during the past month in the Middle Atlantic States (Eastern Pennsylvania, southern New Jersey, Maryland, Delaware, District of Columbia, Virginia) was the largest October contract total on record for this district. The total, $77,784,500 in amount, was 18 per cent ahead of the September, 1928, record, as well as 61 per cent ahead of the October, 1927, total. The following were the most important classes of work in last month's building total: $34,873,600, or 45 per cent of all construction, for residential buildings; $15,692,500, or 20 per cent, for public works and utilities; $13,078,600, or 17 per cent, for industrial projects; and $4,589,800, or 6 per cent, for commercial buildings.

During the first ten months of this year there was $681,129,200 worth of contracts let on new building and engineering work in this territory, being 9 per cent ahead of the amount started during the first ten months of last year.

Contemplated work reported in the Middle Atlantic States in October amounted to $84,503,000. This was 13 per cent ahead of October, 1927.

### The Pittsburgh District

The Pittsburgh District (Western Pennsylvania, West Virginia, Ohio and Kentucky) had $60,595,000 in contracts for new building and engineering work during the past month. The above figure was 7 per cent ahead of the October, 1927, record, but there was a loss of 20 per cent from the total for September of this year. Analysis of the October building total showed the following items to be worthy of mention: $22,030,100, or 36 per cent of all construction, for public works and utilities; $18,504,700, or 31 per cent, for residential buildings; $6,891,000, or 11 per cent, for industrial projects; and $5,980,500, or 10 per cent, for commercial buildings.

Last month's contract record brought the total amount of new construction started in this area since the first of this year up to $623,954,100, being a loss of 7 per cent from the amount started during the corresponding period of last year.

Contemplated projects as reported last month in the Pittsburgh District reached a total of $75,433,800. This figure was 37 per cent in excess of the amount reported in September of this year and it was 6 per cent ahead of the amount reported in October of last year.

### The Central West

October construction contracts in the Central West (Illinois, Indiana, Iowa, Wisconsin, southern Michigan, Missouri, Kansas, Oklahoma and Nebraska) amounted to $154,412,500. This figure shows a gain of 11 per cent over the September, 1928, total, but there was a drop of 21 per cent from the October, 1927, record. The following were the most important classes of work in last month's construction record: $76,606,300, or 50 per cent of all building and engineering, for residential buildings; $23,942,300, or 16 per cent, for public works and utilities; $17,113,700, or 11 per cent, for commercial buildings; and $13,850,400, or 9 per cent, for industrial projects.

During the past ten months there was $1,678,214,600 worth of new construction work started in this district, being a 10 per cent gain over the amount started during the first ten months of last year.

New contemplated work reported last month in the Central West reached a total of $184,820,800, being an increase of 41 per cent over the amount reported in the preceding month and an increase of 6 per cent over the amount reported in October, 1927.

### The Northwest

The Northwest (Minnesota, the Dakotas and northern Michigan) had $9,555,800 in contracts for new building and engineering work during the past month. The above figure was 40 per cent ahead of the total for September of this year and it was 35 per cent in excess of the October, 1927, total. Included in last month's building record were the following items of importance: $4,474,700, or 47 per cent of all construction, for residential buildings; $3,171,200, or 33 per cent, for public works and utilities; $744,300, or 8 per cent, for commercial buildings; and $360,500, or 4 per cent, for educational projects.

New construction started in the Northwest during the first ten months of this year has reached a total of $70,598,700, which was a loss of 7 per cent from the amount started during the first ten months of 1927.

Contemplated projects as reported last month in this district amounted to $9,855,500. This figure was 56 per cent ahead of the amount reported in September of this year and it was 30 per cent above the amount reported in October of last year.

### Southeastern States

Construction contracts awarded for the month of October in the Southeastern States (the Carolinas, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas and Louisiana) amounted to $51,128,300. The above total shows a 10 per cent increase over the amount contracted for during the same month of last year, but there was a slight drop from the amount contracted for during the preceding month of this year. Analysis of last month's building record showed the following important classes of work: $14,843,400, or 29 per cent of all construction, for residential buildings; $13,079,400, or 26 per cent, for industrial projects; $11,270,600, or 22 per cent, for public works and utilities; and $5,765,500, or 11 per cent, for commercial buildings.

New building and engineering work started in this territory during the past ten months has reached a total of $497,288,800, which was a loss of 2 per cent from the amount started during the first ten months of last year.

Contemplated new work as reported last month in the Southeastern States amounted to $50,947,500. This figure is 12 per cent ahead of the September, 1928, record, and there was an increase of 6 per cent over the October, 1927, total.

### Texas

The state of Texas had $14,410,300 in contracts for new building and engineering work during the past month. The above figure shows an increase of 5 per cent over the amount contracted for in October of last year, but there was a drop of 5 per cent from the amount contracted for during the preceding month of this year. Analysis of last month's building total showed the following items of note: $5,037,700, or 35 per cent of all construction, for residential buildings; $4,067,900, or 28 per cent, for commercial buildings; $2,655,700, or 18 per cent, for public works and utilities; and $1,089,000, or 8 per cent, for industrial projects.

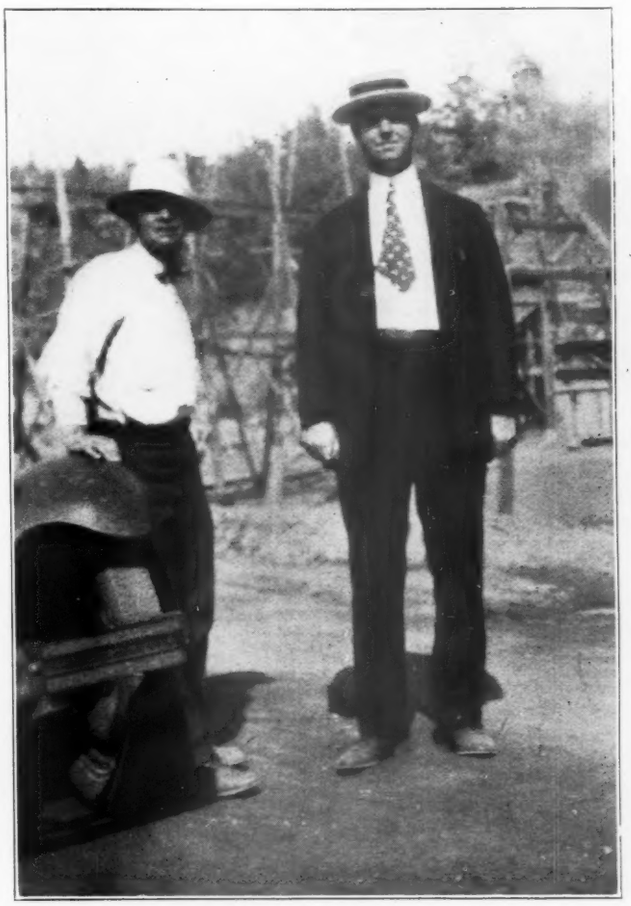
# MATERIALS PLANT FOR CONSTRUCTION JOB

**By George Ransom**

FOR divers reasons of which at least one does not need to be specified, the highways leading to the border of Canada are well traveled. It is therefore a natural consequence that many of them are being improved and this is what is being done with the main road leading from Newport, Vermont, through Derby and Derby Line to the boundary between Canada and the United States. This improvement consists of 8.4 miles of concrete roadway and is known as Federal Aid Job 96 A, B and C.

To engage in concrete construction in the extreme northern part of Vermont means that a source of sand and stone must be developed especially for the purpose. There are no sand, gravel and crushed stone producers in this beautiful, mountainous and strictly agricultural region from which the concrete road builder can purchase his materials.

Joseph McCormick, of East Providence, Rhode Island, is the contractor who is doing this job and as he had handled others in northern New England, one of which was a road between South Paris and West Paris, Maine, previously described in Pit and Quarry, where he had to provide his own materials, this detail of the work has no terrors for him. Perhaps one reason for this is that he enlists the assistance of the engineers of the Good Roads Machinery Company, who laid out and installed all the machinery.

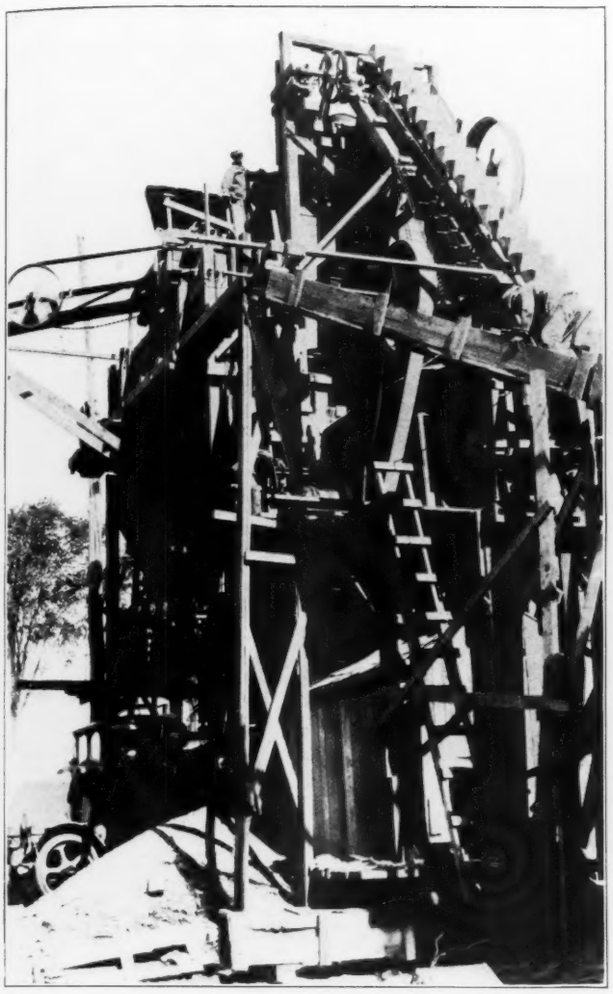


James McCormick, Superintendent, Left, and Joseph McCormick, Owner, Right.

Field Office Building, H. V. French, Assistant Superintendent, at Left, and Anthony Savard, a Master Mechanic, at Right.

Cement Mixer at Work and Truck Serving It. Center Group, Left to Right, Messrs. McAllister and Spaulding, State Inspectors; Mr. Gallagher, Foreman, and Mr. Clark, Steam Roller Operator.

End of Waste Disposal Conveyor from Sand Screen. At left, Leonard Tattrie, Foreman Drag Line and Sand Pit.



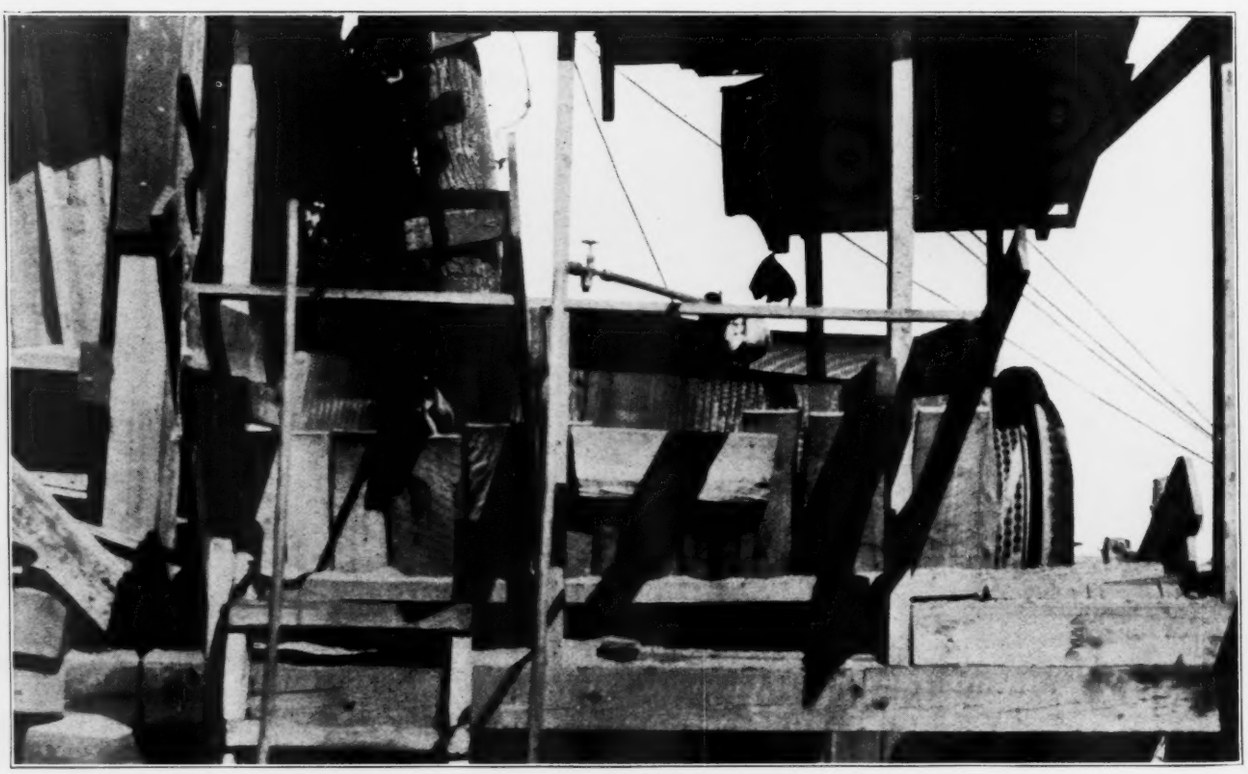
View of Elevator, Screen, Aggremeter and Truck Being Loaded.

Drag Line at Work in Sand Pit.

Drilling at Top of Quarry.

Sand Screen with End of Drag Line Above and Beginning of Conveyor to ,Aggremeter Across Road.

In this case a rather peculiar situation had to be met in that a very good sand bank was located at one side of the road under improvement but the gravel content was practically nil. As luck would have it, there was a ledge of suitable rock directly across the road from the sand bank so the obvious thing to do was to quarry this rock, crush and screen it and mix it with the sand in place of gravel. Thus there is a sand pit operation on one side of the road and a quarry on the other side. The mechanical arrangements whereby these two materials are produced and brought together in the most economical manner have been most ingeniously worked out and make a very interesting story of



Sand Screen with Two Kerosene Torches to Dry Sand in Damp Weather.

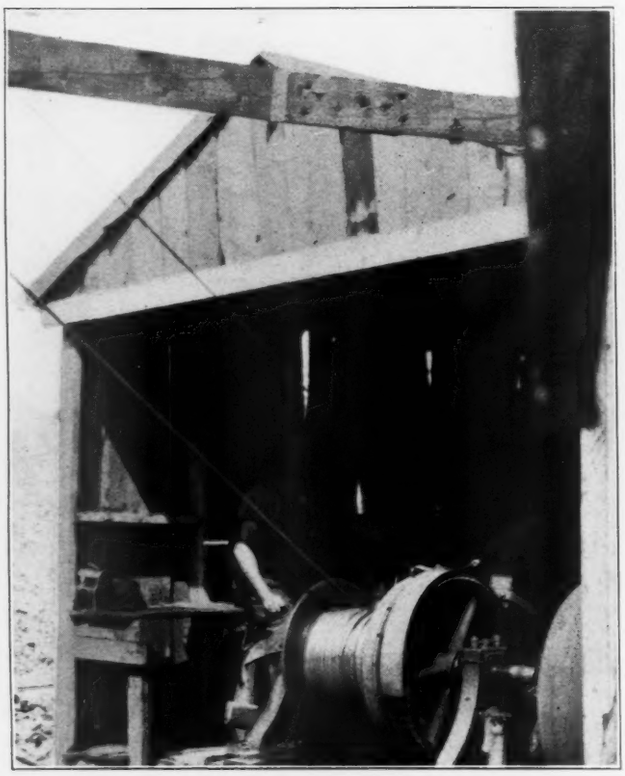
how the local conditions have been met by engineering intelligence.

Let us begin with the sand bank. The material here is excavated by a Sauerman drag line. It is operated by an old Rawson Morrison steam hoist converted to motor drive, which has given many years of excellent service. This scrapes it into a hopper which feeds into a Good Roads revolving jacketed screen by a Good Roads reciprocating pan feeder. This is where the proper grade of sand is produced. Rejects from the screen are dropped to a 12 inch belt conveyor, having a Goodyear belt and Good Roads idlers, 60 feet between centers to the dump. The good sand drops to a similarly made up conveyor which is 300 feet long and extends over the highway to one of the bins alongside the crushed stone bins over the Erie aggremeter bin. These bins have been placed with respect to convenience to the stone crushers as three times as much crushed stone is used as sand. Thus the right thing to do is to move the sand to the aggremeter and to have the latter under the stone sizing screen.

Before passing on to the quarry it is worth while to stop a moment at the sand screen to observe an unusual but decidedly practical use of two Hauck kerosene torches. The sand from this bank has been very wet, especially during the exceptionally rainy summer just passed, so that it has been necessary at times to have two men beating the jackets with sticks. To overcome this difficulty, or rather expense, two Hauck kerosene torches have been installed so that their flames will play on the jacket as the screen revolves. This simple adaptation of a well known device has completely overcome all difficulty from clogging of the jacket and saves the wages of two men.

Paul Sarandrea, Foreman of Quarry and Crushing Plant.

Steam Shovel at Breast of Quarry.



Hoist for Operating Drag Line.

The quarry naturally is on a small scale as it is being operated as only a temporary proposition. Nevertheless it is well equipped with the most modern machinery. Although the stripping is done by hand, the soil being shallow, the drilling is done by Ingersoll Rand drills, one tripod and two jack hammers. Blasting is done with 60 per cent Du Pont gelatin dynamite.

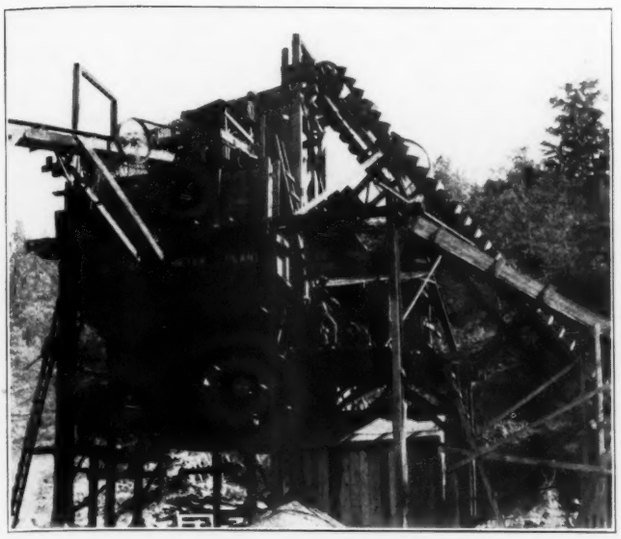
After the rock has been thrown down it is picked up by an Erie steam shovel with a ¾ yard dipper and deposited in Koppel side dump cars. Two tracks extend from the breast of the quarry to the hopper over the primary crusher. A Koppel side dump car runs on each track and each is pulled from the steam shovel and the hopper by means of a home made hoist and Roebling wire rope.

The arrangement of crushing machinery is rather unusual but well adapted to the conditions. The platform where the quarry cars are dumped is at a considerable elevation. The primary crusher, which is a Champion No. 5, is consequently also only part way down the slope from the quarry. As the stone is discharged from the primary it passes into a Good Roads revolving scalping screen. The stone from this screen is taken up by a Good Roads elevator to the sizing screen made by the same company. The oversizes drop into the No. 2½ Climax secondary crusher, then to the same elevator and thence to the sizing screen. A chute and 12 inch conveyors carry the tailings from this screen back to the secondary crusher. The general arrangement is shown in one of the illustrations.

Two sizes of stone for road work are produced. These drop into bins over the Erie aggremeter. The sand bin, fed by the belt from across the road, is also over the aggremeter, as shown in one of the pictures. Trucks, mostly Mack, load under the aggremeter in the usual manner. Waste from the aggremeter is very good for making the shoulders of the road as it takes the place of gravel, which would otherwise have to be obtained elsewhere, and is deposited by a chute to small bin on side of aggremeter bin.

We have now seen how various ingredients of the concrete road mixture are produced and brought together. There are, however, several auxiliary machines which are of first importance. Thus there is a portable Ingersoll Rand gasoline engine driven compressor to supply air for the drills. It is placed under a rough temporary shed to protect it from the weather. A Sandwich bag shaker, also driven by a Sandwich gas engine, saves from 5 to 7 per cent of the cement. The cement salvaged in this way is not used for the road surface but is entirely satisfactory for culvert work and the like.

The Crushing Plant. The Primary Crusher Is Above and the Secondary Crusher Below the Scalping Screen.



Elevator Leading to Screen Over Aggremeter.

All of the machinery except the air compressor and bag shaker is electrically driven by General Electric motors.

The actual road machinery is of the most modern type. It consists of a No. 27-E Multifoote paver and an Ord finishing machine, which is said to be the only machine of its kind so far in use in Vermont and takes the place of about six men. This combination has made the record of laying 1,610 feet of concrete in a day of 9 hours.

It is a noteworthy and pleasing fact that the whole field organization which carries on this road construction is characterized by a most friendly and agreeable attitude. The superintendent, James McCormick, and his supervisors, H. V. French, assistant superintendent, and Paul Sarandrea, quarry and crushing plant foreman, Leonard Tattrie, foreman of the sand pit, Mr. Gallagher, road foreman, and all of the others, including the State inspectors, Messrs. McAllister and Spaulding, certainly are not averse to putting themselves out to explain in detail the working of this very interesting job. Mention should also be made of the good condition in which the machinery is maintained.

## Sulphur and Pyrites in 1927

The production of sulphur in this country in 1927 amounted to 2,111,618 long tons, compared with 1,890,027 tons in 1926, an increase of 12 per cent, and was the largest production ever recorded, according to the United States Bureau of Mines, Department of Commerce. The shipments in 1927 were practically the same as the record-breaking shipments of 1926, being 2,072,109 tons, valued at approximately $38,300,000, compared with 2,072,657 tons, valued at approximately $37,300,000, in 1926. Stocks on hand at the mines were increased approximately 40,000 tons in 1927 and totaled 2,100,000 tons at the end of the year. This is the first year since the closing down of the Sulphur mine, Louisiana, in 1924, that the production of sulphur has been equal to or larger than the shipments. Over 99.9 per cent of the production was made by two companies in Texas, while over 99.9 per cent of the shipments was made by these companies and the company in Louisiana which is still shipping from stocks. Production and shipments of sulphur were also made by two other mines, one in Nevada and one in Utah.

Exports of sulphur or brimstone from the United States totaled 789,371 long tons in 1927, valued at $16,269,254, of which 175,602 tons were exported to Germany, 165,141 tons to Canada, 126,664 tons to France, 114,597 tons to Australia, 50,775 tons to Netherlands, 36,450 tons to the United Kingdom and 25,978 tons to New Zealand. Exports of sulphur or brimstone in 1926 amounted to 576,966 tons. The exports in 1927 were the highest ever recorded and exceeded by nearly 160,000 tons the previous record exports of 1925. Exports of refined, sublimed and flowers of sulphur increased 150 per cent, from 12,002,105 pounds, valued at $236,146 in 1926, to 30,266,810 pounds, valued at $529,346, in 1927, and were mainly to Canada, Germany, United Kingdom and Australia.

The output of pyrites increased from 166,559 long tons, valued at $616,668, in 1926, to 215,786 tons, valued at $804,006, in 1927, or nearly 30 per cent in quantity, and was the largest output recorded since 1920. The quantity sold or used by producing companies also showed a large increase, from 163,217 tons in 1926 to 206,724 tons in 1927, or 27 per cent.

Imports of pyrites in 1927 showed a decrease of 32 per cent in quantity and 24 per cent in value, from 366,151 long tons in 1926, valued at $856,981, to 250,794 tons, valued at $647,512. Of the total quantity imported in 1927, Spain furnished 241,591 tons and Canada the remainder.

The increase in domestic production was not large enough to offset the drop in imports of pyrites in 1927, so that there was a decrease of about 66,000 tons in the quantity of pyrites made available for consumption.

## Hydraulic Society Revises Standards for 1929

The Fifth Edition of the Standards of the Hydraulic Society has just been published. The principal changes from the preceding edition are a revision of the extracts taken from the A. S. M. E. Test Code for Centrifugal and Rotary Pumps and changes in materials recommended for the construction of special service pumps, in line with the latest accepted practice. Its pamphlet contains 80 pages in size 8½ inches x 11 inches, is profusely illustrated and may be had upon application to the Secretary, C. H. Rohrbach, No. 90 West Street, New York City.

# MECHANISM OF THE BURNING PROCESS IN ROTARY KILNS

By Dr. Ernst Rissel*

IN carrying out these investigations on the burning process, as it takes place in the rotary kiln, it was not intended to attempt to discover anything fundamentally new, but to add something to the literature on this subject in the way of practical data. There are quite a number of articles on this subject published in the literature. (See H. Mueller, Prot. 32, pages 366 to 371, year 1909; Tonindustrie Zeitung, volume 27, pages 167ff, year 1903.) This work of Mueller's is the only one that will be mentioned here, for in accordance with the viewpoint of the writer the material that is contained in this article is required for the correct explanation of the cement burning process.

Mueller is content that the determination of the carbon dioxide content of the cement is sufficient to characterize the process of cement making in the rotary kiln. He assumed that "the calcining zone" (that part of the kiln in which "the principal proportion of the carbon dioxide is driven off") begins at a content of thirty percent carbon dioxide (see Mueller's article, page 368) and that this zone goes over into the "sintering zone" (which is that portion of the kiln wherein the conversion of the silica and alumina is effected by means of the lime) when the content of carbon dioxide is from one to three percent.

The writer has abandoned the practice of making a complete analysis of the substances in the kiln and has been content to carry out what is known as "residual analysis." In addition thereto the sulphur trioxide content of the mixture, the loss on ignition, the ingredients that are insoluble in hydrochloric acid and the carbon dioxide content were also determined.

The material which was used in carrying out these determinations was obtained from a 150-foot rotary kiln. Care was taken in sampling the mixture from the kiln to see that the samples were taken from the material distributed over the entire cross-sectional area of the kiln at the point chosen. Approximately seventy-five samples were taken on the third day after the kiln had been shut down and these were obtained over a stretch of 66 feet, calculated from the point where the raw cement mixture was introduced into the kiln. A sample of the material was taken every three feet over this distance, and from this point on every foot and a half. The rotary kiln was rotated during the cooling process, so that all of the material had to move through a distance of approximately fifteen feet.

The samples that were obtained in this manner were dried at a temperature of 115 degrees C. The carbon dioxide contents of all samples up to number 45 were determined with the aid of a Scheibler-Dietrich apparatus. The values that are given in the following tabulation are average values which were obtained from at least two separate determinations. Several of these values were checked by gravimetric determinations according to the Fresenius-Classen method (see Treadwell, II, year 1921, pages 327ff). The carbon dioxide contents of samples 45 and 50 were determined only in accordance with the Fresenius gravimetric method for the reason that in accordance with our experience with the Scheibler-Dietrich method the apparatus is not sufficiently accurate for percentages of carbon dioxide in excess of approximately two percent. The loss on ignition, the lime content, the hydraulic coefficient (silica plus insoluble matter plus $R_2O_3$), the content of magnesia, sulphur trioxide and the ingredients that are insoluble in hydrochloric acid were also determined in samples numbers 0, 5, 10, 15, 20, 25, 30, 35, 40, 45 and 50. The results of the analyses are given in the following tabulation and are also plotted graphically in the accompanying Figure 1:

(1) These figures correspond approximately to the distance in meters at which the samples were

TABULATION No 1

| No. | $CO_2$ % | Loss by ignition % | Total % | CaO Combined $+CO_2$ % | $CaCO_3$ % | Hydraulic factor % | MgO % | $SO_3$ % | Insoluble matter % | Total analysis % |
|---|---|---|---|---|---|---|---|---|---|---|
| (1) | | | | | | | | | | |
| 0 | 26.2 | 27.64 | 42.08 | 33.0 | 59.5 | 26.45 | 0.47 | 3.10 | 13.08 | 99.74 |
| 5 | 32.1 | 33.99 | 42.28 | 40.8 | 73.0 | 22.64 | .... | 0.17 | 16.64 | 98.71 |
| 10 | 32.9 | 34.22 | 42.60 | 41.9 | 74.8 | 22.68 | 0.46 | 0.34 | 16.16 | 99.86 |
| 15 | 32.1 | 33.88 | 42.20 | 40.8 | 73.0 | 23.68 | 0.36 | 0.23 | 14.36 | 100.02 |
| 20 | 31.7 | 33.32 | 42.60 | 40.5 | 72.3 | 23.16 | .... | 0.61 | 13.88 | 99.08 |
| 25 | 31.2 | 32.26 | 41.64 | 39.7 | 71.0 | 24.60 | 0.46 | 0.71 | 13.83 | 99.67 |
| 30 | 28.4 | 29.77 | 42.75 | 34.8 | 64.5 | 26.50 | 0.55 | 0.52 | 14.91 | 100.01 |
| 35 | 20.5 | 21.82 | 49.12 | 25.3 | 46.8 | 26.04 | 0.63 | 1.72 | 13.04 | 99.33 |
| 40 | 7.4 | 10.18 | 53.41 | 9.4 | 16.8 | 34.76 | .... | 0.65 | 7.06 | 99.00 |
| 45 | 0.47 | 1.02 | 60.54 | 0.59 | 1.07 | 36.12 | 0.76 | 0.88 | 2.75 | 99.32 |
| 50 | 0.46 | 0.64 | 63.66 | 0.58 | 1.04 | **** | 0.77 | 0.54 | 1.22 | 100.05 |
| | | | | ****25.34 per cent silica | | | | | 11.52 | |
| | | | | 9.10 per cent $R_2O_3$ | | | | | 10.44 | |

*Tonindustrie Zeitung, 1928, pages 1237-8.

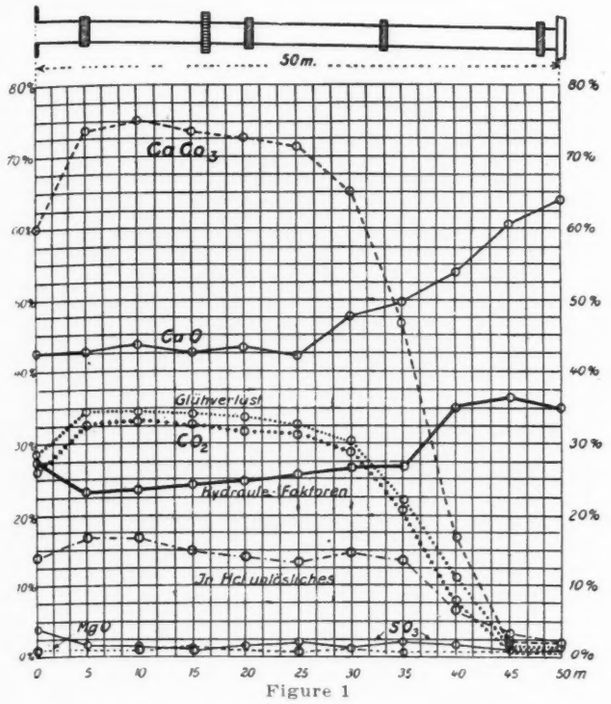


Figure 1

taken, calculated from the point at which the raw cement mixture is introduced into the rotary kiln.

All the calcium carbonate determinations and the carbon dioxide values that were calculated from the former are shown in tabulation number II, and are also represented graphically in Figure 2. The curve for that portion of the mixture which is insoluble in hydrochloric acid is also shown on this curve diagram. The author takes the stand that the decomposition of the insoluble matter in the raw cement mixture is a matter of the highest significance from the standpoint of the explanation of the cement burning process. It must be remembered that the actual burning process must be considered from the chemical viewpoint as the conversion of the silica and the alumina by means of lime.

When the displacement due to rotation of the kiln during cooling is taken into consideration (approximately fifteen feet), then curves which are shown in Figures 1 and 2 may be evaluated in accordance with the following standards:

Up to a distance of sixty feet (which distance is always calculated from the point at which the raw cement mixture is introduced into the rotary kiln) the principal stretches of the curves are almost horizontal. At this point the water is driven out of the mixture with the evolution of small amounts of carbon dioxide. (Curve section I.) As the curves run along further, it can be said that at approximately sixty feet, and gradually at first, decomposition of the calcium carbonate takes place (II), while betwen 75 and 105 feet the principal proportion of the carbon dioxide content is driven out of the mixture (III), which is accompanied by sintering from approximately ninety feet on. (IV.) The sharply defined holding points, $H_1$ or rather $H_2$, of the calcium carbonate or carbon dioxide curves

TABULATION No. II.

| No. | $CaCO_3$ % | $CO_2$ % | No. | $CaCO_3$ % | $CO_2$ % | No. | $CaCO_3$ % | $CO_2$ % |
|---|---|---|---|---|---|---|---|---|
| 0 | 59.5 | 26.2 | 22.5 | 72.5 | 31.9 | 33 | 55.2 | 24.3 |
| 2 | 71.3 | 31.4 | 23 | 72.5 | 31.9 | 33.5 | 53.2 | 23.5 |
| 4 | 74.5 | 32.8 | 23.5 | 71.8 | 31.6 | 34 | 49.5 | 21.2 |
| 5 | 73.0 | 32.1 | 24 | 70.5 | 31.0 | 34.5 | 46.9 | 20.7 |
| 6 | 73.2 | 32.2 | 24.5 | 70.5 | 31.0 | 35 | 46.8 | 20.5 |
| 7 | 74.3 | 32.7 | 25 | 70.9 | 31.2 | 35.5 | 46.3 | 20.4 |
| 8 | 73.0 | 32.1 | 25.5 | 70.0 | 30.8 | 36 | 45.6 | 20.1 |
| 9 | 74.1 | 32.6 | 26 | 69.0 | 30.4 | 36.5 | 45.2 | 19.9 |
| 10 | 74.8 | 32.9 | 26.5 | 68.5 | 30.2 | 37 | 44.3 | 19.5 |
| 11 | 73.4 | 32.3 | 27 | 66.0 | 29.0 | 37.5 | 39.5 | 17.8 |
| 12 | 73.2 | 32.2 | 27.5 | 67.7 | 29.5 | 38 | 35.7 | 15.7 |
| 13 | 72.3 | 31.8 | 28 | 65.7 | 28.9 | 38.5 | 33.3 | 14.7 |
| 14 | 70.9 | 31.2 | 28.5 | 65.2 | 28.7 | 39 | 25.6 | 11.3 |
| 15 | 73.0 | 32.1 | 29 | 67.2 | 29.6 | 39.5 | 18.2 | 8.0 |
| 16 | 73.4 | 32.3 | 29.5 | 65.6 | 28.8 | 40. | 16.8 | 7.4 |
| 17 | 72.6 | 31.9 | 30 | 64.5 | 28.4 | 40.5 | 9.2 | 4.1 |
| 18 | 71.8 | 31.6 | 30.5 | 58.6 | 25.8 | 41 | 8.2 | 3.6 |
| 19 | 72.8 | 32.0 | 31 | 62.5 | 27.5 | 41.5 | 6.0 | 2.6 |
| 20 | 72.0 | 31.7 | 31.5 | 63.0 | 27.7 | 43. | 3.5 | 1.5 |
| 21 | 72.1 | 31.7 | 32 | 58.1 | 25.6 | 45. | 1.06 | 0.47 |
| 22 | 72.3 | 31.8 | 32.5 | 59.8 | 26.2 | 50 | 1.04 | 0.46 |

respectively also corroborate what has just been mentioned.

The main quantity of heat is likewise consumed at this point in the decomposition of the insoluble ingredients in the raw cement mixture. It is consumed at the expense of the total quantity of heat which is added for calcining purposes.

Based on these results, the assumption may be made that there are five different stages in the burning of cement in the rotary kiln. This is similar to the ideas advanced by R. Nacken (see Zement, Volume II, pages 245ff), who came to these conclusions by the thermal investigations.

The conditions can best be determined from Figure 2, in which the curves, which are of the most importance in determining the processes that take place within the rotary kiln, are drawn separately. The principal characteristics of these curves must first be determined before they can be evaluated. (In Figure 2 the broken lines which join the various points in the different curves are covered with a broad line which represents the principal course of the curves.) The carbon dioxide curve is calculated from the carbonate of lime curve, and hence it corresponds to the latter curve in all particulars.

The curve which gives the calcium carbonate values shows the individual changes in direction in a very sharply defined manner, for the reason that it represents larger percentage figures than those in the carbon dioxide curve. Hence the calcium carbonate curve serves best for our purposes. If we compare this curve with the curve for the ingredients insoluble in hydrochloric acid, then it is seen that the curve section 0 is present in both, while on the other hand there are six additional changes in direction in the calcium carbonate curve up to its very end in comparison with only three main sections in the curve for ingredients insoluble in hydrochloric acid. (The denotation of the individual sections of the curves is such that each por-

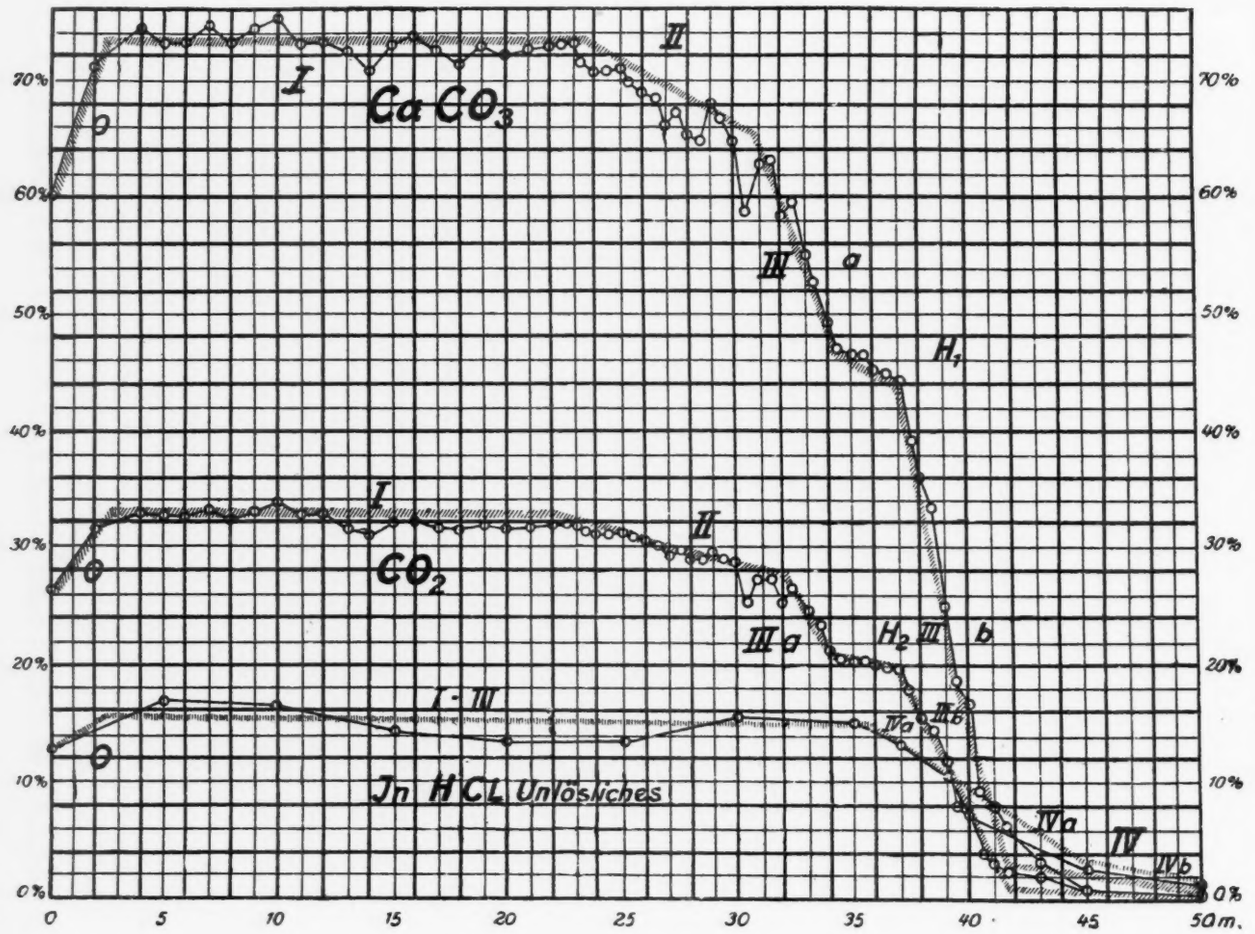



Figure 2

tion of the curve corresponds to a particular stage of the process in the burning of cement.) The section of the curve, denoted as 0, shows changes, which we will discuss further below and which are of no great importance as far as the final result is concerned. When the raw cement mixture reaches the stage that corresponds to the section I of the curve it has been scarcely changed in make-up and it may be assumed that the water is driven out of the mixture at this point. Investigations to determine the moisture content of the raw cement mixture, of the nature that Mueller carried out in conjunction with his carbon dioxide determinations, are considered to be impracticable by the writer. Various reasons are pertinently assigned as the basis for this conclusion, but we will not go into detail on this subject at this point. It is more correct and safer to dry all samples beforehand at the same temperature.

The section of the curve, denoted by II, corresponds to the beginning of calcination, which reaches its maximum point in section III. The section of the curve from I to III, therefore, corresponds to that time period during which the insoluble matter exists as such within the cement mixture, and this means that the insoluble matter does not undergo any important change in the portion of the process that takes place in the rotary kiln during this time period. The curve section IV is characterized by the almost horizontal course of the calcium carbonate curve, indicating that practically all of the carbon dioxide gas has been evolved. On the other hand the sudden drop of the curve, indicating the percentage of insoluble matter in the raw cement mixture, which is shown by the section IVa, and then the less steep drop over the section IVb, show that the insoluble matter is gradually disappearing, and hence is undergoing conversion.

Section III of the calcium carbonate curve is broken by a clearly defined holding point, which represents a number of values which follow one after the other. We must assume that the sintering of the cement starts at this point, which is also expressed in graphical terms by the drop of the curve representing the percentage of insoluble matter in the raw cement mixture.

It is found that the sintering of cement is not a phenomenon which can be considered as being directly connected with the calcining stage of the process (and neither can it be considered as a gradual transition from the calcining stage), but that it sets in as soon as half of the carbon dioxide that is present in the combined form in the mixture is driven out of it.

In accordance with these conclusions, it is possi-

ble to divide the cement burning process into five different stages. These are as follows:

1. The raw cement mixture is dried. (Section I in the curves.)

2. The raw cement mixture is heated up to the temperature of calcination with partial loss of carbon dioxide. (Section II in the curves.)

3. The principal portion of the carbon dioxide begins to be evolved. (Section IIIa in the curves.) Then from the holding point on we have:

4. The beginning of sintering (sections IIIb and IVa in the curves).

5. The calcination is practically completed and sintering follows. (Sections IV and IVb in the curves.)

It therefore follows that the use of the word "calcining zone" or "sintering zone" must always be considered to be somewhat imaginative, for the reason that sintering of the cement sets in while calcination is taking place. The older definition defines that portion of the process in which "the main portion of the carbon dioxide is driven out," as the "calcining zone" and that portion of the process which comes after this stage as the "sintering zone," and hence sets definite limits for these two stages one from the other. We have indicated that this is not true. It would, nevertheless, be merely a battle of words to discuss this point further. The fact remains that there are five different stages in the cement burning process and that one of these stages is characterized by the coincidence of the two processes, the calcination and the sintering of the cement mass.

These five stages of the cement burning process are also characterized by the colors of the samples that correspond thereto. Up to a distance of sixty feet from the point where the raw cement mixture has been introduced into the rotary kiln it is found that the slightly reddish yellow-gray of the pulverized sample gradually becomes pink in color continually becoming lighter in shade. From this point on the color is grayish yellow and this color varies through yellowish gray to the greenish gray which is the final color of the finished clinker. Investigators tell of the following colors observed in the clinker, namely yellowish gray, pale pink, red, light leather yellow and steel gray. When a color chart is made of the various samples that are taken from different points in the rotary kiln and which represent the various stages of the burning process as it takes place therein, it is possible to follow closely the entire course of the burning of cement and the changes that take place therein. The continuous transition from one stage of the process to the other can be even better observed from this series of colors than from the curve sheets. For example the first signs of incipient sintering can be very definitely detected at a distance of 102 feet from the point where the raw cement mixture was introducd into the rotary kiln, (see sample number 39). The first dark particles of sintered cement are seen in this yellowish gray sample. (All the samples were ground to such a degree of fineness that only one to two per cent residue was left behind on the 4900 mesh per square centimeter screen.)

A word must be said in regard to samples numbers 0 to 4 inclusive and the section of the curves indicated as 0. When this section of the curves is studied, one is first inclined to believe that certain errors were made in the method of taking samples, which were caused by the movement of the material in the rotary kiln. Nevertheless, when a closer examination and study of the curve are made (now Figure 1), it is seen that this is not the case but that chemical changes have already taken place at the points corresponding to this curve section. The following explanation must be the correct one.

The temperature at the entrance to the kiln is higher than at points further along its length. Just at the very introduction of the raw cement mixture into the rotary kiln a certain portion of the carbon dioxide contained in the ingredients of this mixture is driven off. The process that takes place as the chemical reaction proceeds must be in accordance with the chemical equilibrium: $CaCO_3 = CO_2 + CaO$. This equilibrium is dependent upon the pressure and the temperature. The carbon dioxide gas is carried along through the kiln by the gases of combustion formed by burning fuel at the head of the kiln. The substantiation of this theory is found in the congruent course of all the curves. If it is argued that errors were made in the method of taking samples from the rotary kiln, then there would have to be certain irregularities in certain curves as compared with the others.

A portion of the fume or flying dust settles in this portion of the rotary kiln, which is included from the point of entrance of the raw cement mixture to a point fifteen feet away. Carbon ash forms the principal portion of the fume or flue dust. The sulphur trioxide, however, which was found in the sample of dust examined, comes almost exclusively from that which is present in the clinker, while the raw materials contain only a fractional part of this ingredient. When the sulphur trioxide curve is examined it is seen that the uncommonly high sulphur trioxide content of 3.10 per cent at the point of entrance of the raw cement mixture into the rotary kiln—which is extraordinarily high for the existing conditions—must indicate that flue dust has been precipitated.

## Conclusions

1. Approximately seventy samples, taken from a rotary cement kiln, were examined to determine

the calcium carbonate or carbon dioxide content.

2. "Residual analyses" were carried out on eleven samples (taken at distances of fifteen feet from one another in the kiln), and furthermore, the percentage of material insoluble in hydrochloric acid, the sulphur trioxide content and the loss on ignition were also determined.

3. The results are shown in tabular form as well as in graphical form in curves.

4. Five distinct stages were determined in the burning process.

5. It was definitely shown that it is impossible to speak of a "calcining" zone or of a "sintering zone" in the sense that they correspond to distinct subdivisions of the cement burning process.

## U. S. Leads in Steel

The United States is the world's greatest steel maker. This country's manufactures of crude steel exceed the output of its three leading competitors combined, it is found from a study of data of the Federal Reserve Board. America's annual steel production totals approximately 44,935,000 short tons, figures for the last full twelve-month period on record indicate. During the same period Germany produced 17,967,000 short tons, England 10,192,000 tons, France 9,120,000 tons—a total of 37,279,000 tons, or 7,565,000 tons less than the United States alone. Statistics of steel production in other nations show that Belgium manufactures approximately 3,700,000 tons annually, Russia 3,400,000 tons, Italy 1,750,000 tons, and Canada 860,000 tons, indicating that the output of the United States is practically equivalent to the total of all other countries.

## Asphalt Association to Convene

The Seventh Annual Asphalt Paving Conference, under the auspices of The Asphalt Association and the Association of Asphalt Paving Technologists, will be held in the Roosevelt Hotel at New Orleans, Louisiana, December 3, 4, 5, 6 and 7, 1928.

A comprehensive program has been arranged, and the personnel of the speakers is a guarantee of the excellence with which the various subjects will be treated.

The first day, Monday, December 3rd, will be given to registration, an informal Open House Reception, and special features.

In addition to the program and special sessions scheduled for the following days of the conference, entertainment will be provided consisting of an afternoon boat trip on the Mississippi River and New Orleans Harbor, afternoon entertainment feature races at Jefferson Park, Bridge and Luncheon at the Orleans Club for the ladies, followed by a drive through The Old French Quarter, and a Golf Tournament for men at The Metaire Club.

## Grade Crossing Accidents Reduced

For the first time since the motor vehicle became a factor on the American highways, an actual decrease has been made in the number of accidents at grade crossings.

The hundreds of millions of dollars that have been spent by the railroads of this country and by the highway departments are having their effect.

The American Road Builders' Association is authority for the statement that last year, in spite of the enormous increase in vehicles on the road, there was a 5 per cent saving in lives alone at grade crossings, as compared with the preceding year. This means a much greater actual saving considering the increased number of vehicles.

To accomplish this, the railroads and the highway departments have eliminated hundreds of crossings. They have installed modern, effective signaling devices at other crossings. They have erected gates at dangerous ones and have added to the number of crossing watchmen.

Today they are pushing this work forward with greater and greater vigor. Plans have been drawn for the elimination of practically all the most dangerous crossings, and the work is done as speedily as funds are available. It is an extremely costly work, inasmuch as the elimination of a single crossing frequently entails the erection of one or more expensive bridges, the building of approaches and the raising of roads or streets.

In addition, the railroads and highway departments have carried on one of the most widespread and successful campaigns of safety education in history. Posters, placards, billboards and paid advertising space have been used to warn the public of the danger of recklessness and carelessness in driving. The slogan "Cross Crossings Cautiously" has become firmly fixed in the public mind.

The American Road Builders' Association, including many of the foremost highway officials in the country, has co-operated in this educational program, organizing highway safety clubs, distributing literature and working through the churches and schools.

## Construction Projects in Great Britain

Construction work planned in Great Britain, as reported by Commercial Attache William L. Cooper, London, includes the following projects: A £100,000 hospital, a £50,000 garage, a new surgical ward block and operating theaters to cost about £177,225, London; harbor improvements to cost £310,000, Jersey; £100,000 project for construction of public baths, Hastings; a £50,000 hospital extension, Tipton; new fishing dock, estimated to cost £1,000,000, Grimsby; a cinema theater of 1,500 capacity, Manchester; a £57,000 contract for harbor works, Littlehampton.

# Highway Research Board To Meet in Washington

The Eighth Annual Meeting of the Highway Research Board will be held December 13 and 14, 1928, at the National Academy of Sciences and National Research Council Building, B and 21st Streets, Washington, D. C. This will be an open meeting and every one interested in the development of the construction and use of highways is invited to attend.

It is the ambition of the officials to make the meetings unusually interesting. To this end the committees are preparing their most interesting topics for full platform presentation and ample time will be allowed for discussion from the floor. The full reports will include much valuable information which will be published in the Proceedings, which expect to be ready for distribution early in the new year. The meeting will cover two days, with the annual Highway Research Dinner on the evening of December 13.

## Committee Reports For 1928 Meeting

The report by A. T. Goldbeck, chairman, will be presented in such a manner that the data will be immediately available to the practising engineer. In the past the various fundamental principles which have been established have been reported by the committee with supporting data. It is the aim this year to apply those principles to practical design, giving numerical examples wherever feasible. It is hoped to present practical methods based upon sound research for taking care of unusual drainage and other subgrade conditions, as well as methods for design of both rigid and non-rigid pavements, covering cross section, reinforcing, joints, dowel spacing, edge strengthening and design of secondary roads.

Reports on new developments in finishing bituminous surfaces, the Bouyoucos hydrometer in making mechanical analyses of soils, settlement in peat marshes, and factors to be considered in the correlation of soil and pavement conditions will be made. Individual portions of the report will be presented by H. M. Westergaard, V. R. Burton and Samuel Eckels.

Two principal topics of the character and use of road materials will be discussed by H. S. Mattimore, chairman. A report of the extensive research work upon which the Pennsylvania design for guard rail is based will be made by him and a discussion of the properties of bituminous materials for surface treatments is in preparation by Messrs. Emmons, Lang and J. E. Myers.

The committee on highway traffic analysis, of which G. E. Hamlin is chairman, will discuss the relation of traffic to accidents under these headings: Accidents on state highways; safety on state highways as compared with city streets and county or township roads; safety of highly improved roads as compared with lightly improved or unimproved roads; effect of physical conditions of road on recurrence of accidents; effect of increasing volume of traffic on recurrence of accidents. Last year's report will be reviewed and data with respect to capacity of two, three and four lane roadways, time losses, and effect of various physical conditions upon carrying capacity, etc., will be brought up to date. Dean Johnson will present an illustrated report on the Maryland Aerial Traffic Survey, between Washington and Baltimore.

A review of the methods of highway finance used in the various states in promoting the financing of state highway systems will be reported by H. J. Kirk, chairman. There will also be a discussion of sound economic principles in the financing of road improvements.

Owing to the untimely death of Chairman Fletcher, the work of this Committee on Causes and Prevention of Highway Accidents has been greatly retarded. A reorganization has been effected under the chairman, Dean Johnson, and plans for the future will be presented. The committee expects to report its recommendations concerning the Model Municipal Traffic Ordinance and model Motor Vehicle Law of the National Conference on Street and Highway Safety.

Under the Economic Theory of Highway Improvement, of which T. R. Agg is chairman, Professor E. H. Lockwood will discuss the Yale experiments on air resistance of automobiles.

The report on Maintenance, of which G. C. Dillman is chairman, will discuss briefly and bring up to date the topics covered during the past few years, making definite recommendations wherever possible. Among the list of subjects are: Crack fillers for concrete pavements; dust prevention and surface treatment of gravel; roads including sizes of mulch gravel; mituminous wearing surfaces for gravel roads; rhythmic corrugations in gravel roads; maintenance machinery for gravel roads; earth roads oiling; bituminous treatment of earth, sand-clay and top-soil roads; snow removal—equipment and drift prevention; guide, caution and danger signs; maintenance accounting; maintenance costs as affected by the life of the road; maintenance costs as affected by type of pavement and amount of traffic; coverings for poorly constructed and disintegrating concrete pavements; maintenance of concrete pavements; annual reduction in thickness of gravel roads under different traffic and effect of dust palliatives; berm maintenance; cause and cure of frost boils; bridge maintenance, including painting and reflooring.

# AMERICAN STANDARDS ASSOCIATION ESTABLISHED BY UNANIMOUS VOTE OF MEMBER BODIES

UNANIMOUS approval by the thirty-seven member bodies of the establishment of the American Standards Association to succeed the American Engineering Standards Committee is announced by William J. Serrill, assistant general manager of the United Gas Improvement Company of Philadelphia. Mr. Serrill was chairman of the Standards Committee, and now becomes president of the American Standards Association. One of the most important results of the abandonment of the committee form of organization will, according to Mr. Serrill, be a much greater degree of participation by trade associations in the direction of the national industrial standardization movement.

One of the first acts of the Association will be the organization of a board of directors composed of twelve industrial executives. This newly created board, which was established in recognition of the increasing part which executives are playing in the standardization movement, will control the general administration and policies of the association. The old Main Committee, made up of representatives of all the member bodies, now becomes the Standards Council, and in its hands will rest all matters connected with the adoption and approval of national standards.

The American Engineering Standards Committee was organized in 1917 by the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society of Testing Materials. The purpose of the organization was to provide a method of cooperation which would prevent duplication in standardization work and the promulgation of conflicting standards. The United States Government Departments of War, Navy and Commerce became members of the committee in 1919. New members were from time to time added until at the time of the present reorganization there were 37 member bodies. There are in addition 350 sustaining members, including manufacturers, distributors, associations, etc.

A broad range of industries and of types of standards are included in the work of the association. The following types of standards are covered:

1. Nomenclature. Definitions of technical terms used in specifications and contracts and in other technical work.
2. Uniformity in dimensions necessary to secure interchangeability of parts and supplies, and the interworking of apparatus.
3. Quality specifications for materials and equipment.
4. Methods of test.
5. Ratings of machinery and apparatus which establish test limits under specified conditions as a basis of purchase specifications, or which establish requirements as to performance, durability, safety, etc., under operation.
6. The codifying of provisions for safety.
7. Rules for the operation of apparatus and machinery in industrial establishments.
8. Concentration upon the optimum number of types, sizes, and grades of manufactured products.

The method of work is simply a systematic plan of cooperation by which organizations interested in any particular project participate in deciding whether the work shall be undertaken at all, in formulating the standard, and in its ultimate approval as an "American Standard."

The decision as to whether work on a standard shall be undertaken is made by a general conference of representatives of all the groups concerned with the standard or by any equivalent method which assures a consensus of opinion. One of the most important results of the reorganization is the more flexible procedure for adopting standards now available. Four methods are provided:

1. By sectional committees, which are essentially joint committees made up of officially accredited representatives of all groups having an important interest. The sectional committees may work:
   a. Under the administrative support and direction of one or more of the bodies principally concerned —termed "sponsors."
   b. Autonomously, reporting directly to the American Standards Association.
2. The approval of existing standards when it may be shown that the standard represents a real consensus.
3. By the approval of "proprietary" standards when it may be shown that they are supported by a consensus of those substantially concerned.
4. By the official acceptance of the interested groups concerned.

The United States Government cooperates actively with the association in several ways. In addition to the seven branches of the Federal Government represented on the Standards Council, 38 branches are represented on sectional committees. Twenty-one association projects are sponsored by various branches of the federal government, which are represented on almost every sectional committee working under association procedure. The Department of Labor is cooperating in all safety code work and is publishing approved safety codes as government documents. The association assists the Federal Sepcifications Board by circulating proposed specifications for criticism by industry in order to determine their acceptability to industry.

# PIT AND QUARRY FOREIGN DIGEST

Figure 1—A Cement Shed

## Storage of Cement

The effect of storing cement for long periods in a shed which would likely be used, was found to result in a decrease in desirable properties. The tensile and compressive strengths decreased uniformly according to the length of storage, the beginning of the setting interval required more time, and the setting interval itself was extended with several months' storage. The cement was stored in paper sacks, on a platform about 1 foot above the floor of the shed as shown in Figure 1. Compressive strength tests were then made and the strength curves plotted up to 28 days on a blank, and after 1, 2, 3 and 6 months storage. Figure 2 shows the curves produced. The blank (0) and (1) show an identical curve, indicating no loss of strength in 1 month's storage. The other curves 2, 3 and 6 show a loss dependent on length of storage. Figure 3 shows the same results in percentage of strength remaining after these intervals. The 28 day curve shows a loss of nearly 10% in six months' storage. V. Bährer. (Zement, October 25, 1928.)

## Advances in Cement Manufacture

In general, the strength of a cement increases with its proportion of lime, but the stationary kiln does not permit satisfactory production of cements high in lime. The rotary kiln permits the use of

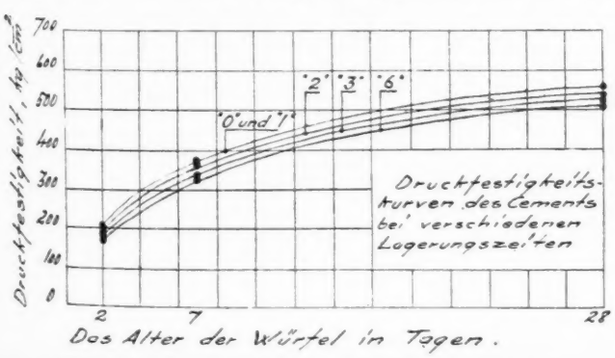



Figure 2—Compressive Strength Curve of Cement After Different Storage Intervals

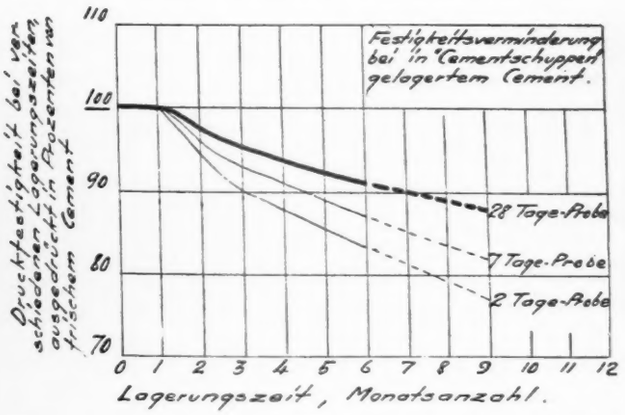



Figure 3—Strength of Stored Cement in Percentage of Fresh Cement Strength. Length of Storage in Months Shown

higher temperatures so that the various ingredients enter into a more vigorous chemical combination, and also the production of a more uniform product. The higher the temperature, the more complete the combination, and the greater the amount of lime that can be held by the cement without causing unsoundness. Such hard, fully burnt material must be finely ground to be useful. Cements have been improved in the more perfect burning of the clinker and the finer grinding of the product. Although a high alumina content is usually a disadvantage, it has been found that over a certain range complete fusion gave high aluminous cements of great value, because of their rapid hardening properties. Fine grinding is necessary because the cement particles are too dense to allow water to permeate through them; and react on the surface only. A large part of the cement in concrete remains inert, due to the absence of reaction in the center of the cement particle. Lime is liberated from the cement constituents by the action of water. This free lime constitutes a source of weakness unless combined with a "pozzolana," which may be the original volcanic ash, trass, finely ground blast furnace slag, active silica, or lightly burnt clays. It has been found that such acidic substances gradually combine with this liberated lime, converting it to insoluble compounds, and increasing the resistance of the concrete to both fire and sea water. C. H. Desch. (Cement & Cement Manufacture, Vol. 1, pp. 5-8. London, Sept., 1928.)

## Magnesia Cement on Concrete

The surface of concrete covered with a cement stucco showed places on which decomposition occurred. Analysis showed a high magnesia content, but no longer was the ratio of $MgCl_2$: 5MgO discernible. The cause of the decomposition, however, was referred to the presence of magnesia cement in the stucco. Stucco must have an extremely low magnesia content to avoid this phenomenon. H. Richarz. (Tonindustrie Zeitung, Sept. 29, 1928.)

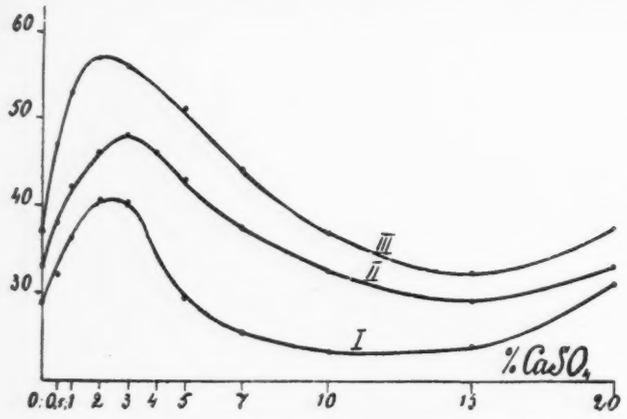



Figure 4—Tensile Strength Curves with $CaSO^4$

## Calcium Sulphate and Cement

The effect of the addition of varying amounts of calcium sulphate, both anhydrous and with 2 molecules of water (gypsum), were studied. Results show that small additions increase the compressive and tensile strengths of the test pieces formed from the mixture, but that further additions cause a decrease in these properties. Figure 4 shows the effect of addition of anhydrous $CaSO_4$ upon the tensile strength. Curves I, II and III are those values in kg. per sq. cm. made after 4, 7 and 28 days. At 28 days the addition of 2% calcium sulphate shows an enormous increase in the tensile strength of over 50%. The maximum for compressive strength is shown to be an addition of 3% (Figure 5). Similar effects are shown (Figures 6 & 7) with gypsum, the maximum increase in tensile strength occurring with 4%, and with compressive strength at 2%. P. Budnikoff & W. M. Leschoeff. (Zement, October 18, 1928.)

## Gauging Concrete

A process for proportioning water and aggregate for concrete consists in combining aggregate having a variable moisture content with water until the sum of their weights at a given combined volume equals a predetermined amount. The apparatus consists of a telescope hopper whose volume can be adjusted, connected to a weighing device. If it is desired to make a concrete containing

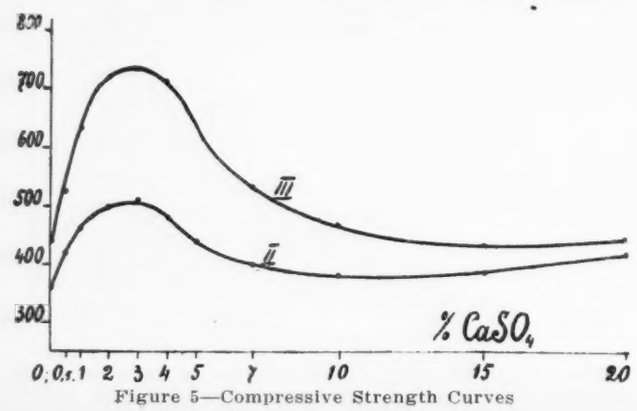



Figure 5—Compressive Strength Curves

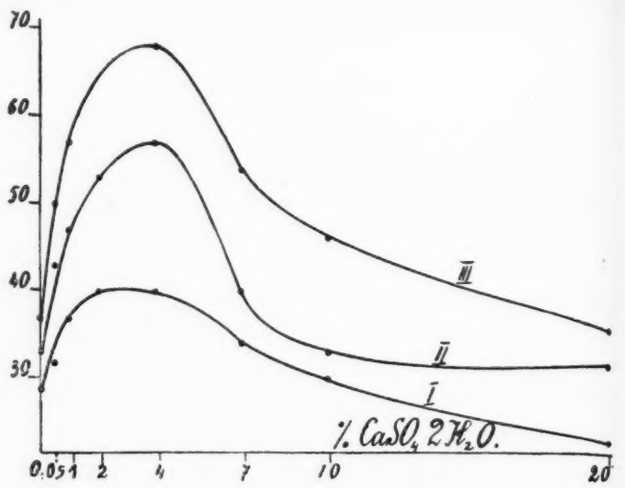



Figure 6—Tensile Strength Curves with Gypsum Additions

70 lbs. of water and 200 lbs. of dry sand of a specific gravity of 2.5, the volume of the hopper is adjusted until it is equal to 150 lbs. of water, the actual volume of the sand being equal to 80 lbs. of water; 70 lbs. of water are then introduced into the hopper and sand having an unknown water content is added from a bin until the total weight is 270 lbs. The water in the sand displaces an equal amount of water originally in the hopper, this surplus passing out through an overflow spout. C. S. Johnson. (British Patent 295, 894.)

## Rapid Hardening Portland

The essential feature of rapid hardening portland cement is its fine state of division, the best quality leaving less than 1% residue on a 180x180 mesh sieve. The cost of this fine grinding is the principal item in raising the price of this cement above that of ordinary portland. Rapid hardening portland is of a somewhat more "delicate constitution" than ordinary portland, and is more easily affected by atmospheric influences, both as a powder and in the early stages of hardening. Greater care and attention to detail are necessary. Tests of this cement must be made under carefully standardized conditions in order to obtain concordant results. D. B. Butler. (Cement & Cem. Man. Sept., 1928.)

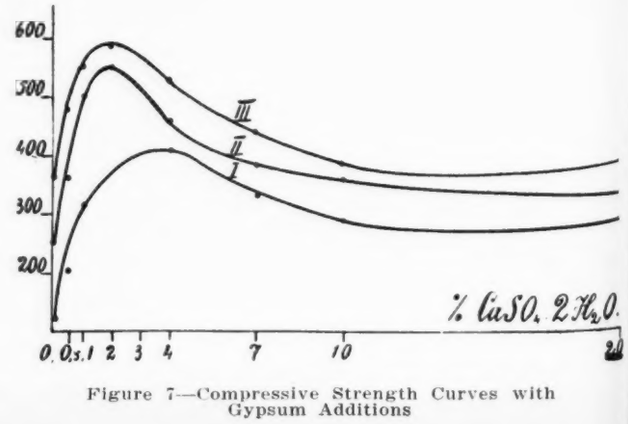



Figure 7—Compressive Strength Curves with Gypsum Additions

# INTIMATE NEWS OF MEN AND PLANTS

## North Carolina Quarry Plans Expansion

The Salem Quarries, Inc., Winston-Salem, North Carolina, plans an expansion program which will include the installation of new machinery and equipment. The present daily output is 500 tons, mostly ballast and concrete aggregate. A spur line railway will be built from Longview to the quarries. H. C. Perkins is president of the company.

## California Firm Opens New Material Yards

The Triple A Company, San Francisco, California, which was formed recently, has opened a material yard at 1755 Bruno Avenue. According to Frank C. Hatch, former president of the State Gravel Association, who is president and general manager of the company, this is the first of a series of yards which will be opened at regular intervals. Other officers are: Robert E. Hatch, secretary; R. Marvin Greathouse, vice president and treasurer; and Ray H. Montagne, second vice president.

## New York Gypsum Firm To Build Plant

The Atlantic Gypsum Products Company, 40 Rector Street, New York, is to build a one story crushing plant with storage and distributing facilities. This project will cost about $35,000.

## Montana Plant Building

The Vermiculture and Asbestos Company of Libby, Montana, is constructing a manufacturing plant in that city near the Great Northern railway. The plant is expected to be in operation by the first part of December. F. J. Buck is production manager for the company.

## Pen-Dixie Appoints Service Manager

J. H. Chubb has been appointed manager, Service Bureau, Pennsylvania-Dixie Cement Corporation, with headquarters in the New York office, 131 East 46th St. Mr. Chubb, a graduate Civil Engineer, has had over twenty years' experience observing the results obtained with and advising concerning the proper use of Portland cement and concrete in all classes of construction work. He is a member of the Western Society of Engineers, American Concrete Institute and American Society for Testing Materials. For many years he has been a member of the Committee on Technical Problems, Portland Cement Association, which outlines the tests and activities and reviews publications of the Association's research laboratory.

He has been instrumental in promulgating the idea of Concrete Mixes that would produce with Standard Portland Cement, concrete having a 3-day strength as great as that of ordinary concrete at 28 days. Satisfactory results in many diversified concrete jobs have proven it to be sound in every respect and made it possible to place concrete work in service in as many days as it formerly took weeks. Mr. Chubb is the author of a number of booklets covering the proper use of concrete and has prepared articles that have appeared in the technical press. His technical training and wide experience in the field are now available to this company and he will be pleased to furnish information concerning the proper use of cement and concrete and give such service and assistance as does not conflict with the activities of engineers, architects and firms to whom such work properly belongs.

## California Lime Plant Changes Hands

M. Mandoni of San Bruno, California, has taken over the lime plant formerly owned by C. I. Chubbick. This plant is operated in conjunction with the Prest-O-Lite plant at South San Francisco. Fertilizer and whitewash are the main products. D. Doherty is superintendent.

## Arizona Asbestos Mine to Be Developed

Dr. R. V. Mattison of Ambler, Pennsylvania, recently purchased a controlling interest in the Bear Canyon Asbestos Company near Globe, Arizona. Mr. Mattison is president of the Bell asbestos mines of Canada.

The Bear Canyon company owns 20 claims on the San Carlos reserve about 21 miles from Rice and 3½ miles from the Rice-Springerville highway, which are said to contain valuable deposits. Prospecting machinery has been ordered and plans are being made for a crushing and cleaning plant to be in operation by spring.

Officials of the company are: Dr. Richard V. Mattison, president; Royal Mattison, eastern vice president, and Frank J. Lunn, western vice president.

## New Florida Plant

Connell and Schultz, Inverness, Florida, have erected a small crushed stone plant at the quarry at McAllister Spur. Telsmith crushers have been installed and screenings and ¾ and 1½ inch concrete rock will be produced. M. D. Schultz and J. M. Connell will be in charge of this plant as well as the lime rock plant also located there.

## Charles H. MacNider Dies

Charles H. MacNider, president and general manager of the Northwestern States Portland Cement Company, died recently at his home in Mason City, Iowa. He was also president of the First National Bank of Mason City and a director of many other companies, among them the Federal Reserve Bank of Chicago and the Alpha Portland Cement Company. He is survived by his widow and a son, Hanford MacNider, former Assistant Secretary of War.

## Arkansas Quarry to Expand

The Batesville Marble Quarries Company, which operates two quarries and a cutting plant near Pfeiffer, Arkansas, plans to install a new plant soon. According to John Cargill, manager and part owner of the company, the new plant will be equipped with modern marble cutting machinery.

## Texas Cement Plant Under Way

Work on the new Republic Portland Cement Company plant 12 miles north of San Antonio, Texas, is progressing rapidly. Pouring of foundations is almost completed. A one-mile spur line has already been built and a three-mile line is under construction.

## Washington Plant Sold

B. N. Bartlett of Portland, Oregon, recently purchased the plant of the Yakima Sand and Gravel Company in East Selah, Washington. He plans to produce road gravel and washed sand and gravel.

# DISTRIBUTION OF CEMENT

The following figures show shipments from Portland cement mills distributed among the States to which cement was shipped during August and September, 1927 and 1928.

## Portland cement shipped from mills into States in August and September, 1927 and 1928, in barrels

| Shipped to— | August | | September | |
|---|---|---|---|---|
| | 1927 | 1928 | 1927 | 1928 |
| Alabama | 243,841 | 315,341 | 229,592 | 255,120 |
| Alaska | 338 | 382 | 742 | 277 |
| Arizona | 34,598 | 57,033 | 38,589 | 56,940 |
| Arkansas | 85,164 | 150,173 | 87,996 | 136,794 |
| California | 1,158,661 | 1,166,958 | 1,114,333 | 1,020,406 |
| Colorado | 124,628 | 147,267 | 107,896 | 140,150 |
| Connecticut | 239,392 | 279,631 | 257,188 | 233,257 |
| Delaware | 40,815 | 29,447 | 58,667 | 34,578 |
| District of Columbia | 103,217 | 83,553 | 100,626 | 81,703 |
| Florida | 180,328 | 105,108 | 152,129 | 98,859 |
| Georgia | 193,713 | 181,254 | 149,740 | 155,421 |
| Hawaii | 28,219 | 25,413 | 11,790 | 21,378 |
| Idaho | 30,000 | 45,284 | 29,588 | 30,886 |
| Illinois | 2,066,172 | 2,581,921 | 1,902,780 | 2,553,958 |
| Indiana | 868,669 | 804,868 | 807,523 | 847,440 |
| Iowa | 602,653 | 813,328 | 563,779 | 738,450 |
| Kansas | 251,022 | 233,127 | 261,769 | 272,461 |
| Kentucky | 283,184 | 216,674 | 245,577 | 211,690 |
| Louisiana | 147,709 | 125,319 | 129,457 | 112,202 |
| Maine | 81,018 | 71,721 | 63,493 | 79,289 |
| Maryland | 366,046 | 260,189 | 285,248 | 227,573 |
| Massachusetts | 314,527 | 308,837 | 310,562 | 315,939 |
| Michigan | 1,788,820 | 1,707,324 | 1,459,078 | 1,692,432 |
| Minnesota | 480,599 | 401,260 | 414,197 | 377,096 |
| Mississippi | 111,007 | 122,486 | 92,276 | 129,970 |
| Missouri | 560,364 | 541,927 | 489,155 | 554,767 |
| Montana | 50,776 | 66,954 | 43,797 | 59,124 |
| Nebraska | 180,063 | 127,833 | 195,109 | 159,659 |
| Nevada | 6,149 | 14,101 | 4,845 | 13,635 |
| New Hampshire | 56,223 | 69,903 | 66,537 | 72,947 |
| New Jersey | 853,588 | 878,977 | 960,390 | 884,759 |
| New Mexico | 23,750 | 43,079 | 23,103 | 27,552 |
| New York | 2,749,722 | 2,774,981 | 2,703,962 | 2,398,193 |
| North Carolina | 340,093 | 218,950 | 303,283 | 167,910 |
| North Dakota | 69,872 | 61,931 | 35,938 | 43,739 |
| Ohio | 1,381,581 | 1,549,784 | 1,406,311 | 1,410,196 |
| Oklahoma | 298,452 | 286,023 | 329,676 | 361,360 |
| Oregon | 188,586 | 175,733 | 127,909 | 132,521 |
| Pennsylvania | 1,706,430 | 1,699,137 | 1,683,405 | 1,519,073 |
| Porto Rico | 3,500 | ..... | ..... | 500 |
| Rhode Island | 85,312 | 71,291 | 76,597 | 77,316 |
| South Carolina | 103,455 | 152,387 | 100,262 | 108,575 |
| South Dakota | 50,994 | 62,440 | 56,882 | 58,274 |
| Tennessee | 285,835 | 323,794 | 253,945 | 353,282 |
| Texas | 533,591 | 690,901 | 449,994 | 515,419 |
| Utah | 60,332 | 65,376 | 43,021 | 49,468 |
| Vermont | 67,255 | 103,293 | 71,529 | 108,095 |
| Virginia | 211,679 | 214,602 | 197,320 | 173,104 |
| Washington | 335,681 | 408,566 | 264,748 | 291,994 |
| West Virginia | 239,578 | 166,289 | 250,542 | 166,816 |
| Wisconsin | 1,035,131 | 809,545 | 711,004 | 791,171 |
| Wyoming | 22,131 | 30,976 | 19,223 | 27,555 |
| Unspecified | 23,887 | 30,779 | 38,980 | 41,593 |
| | 21,348,350 | 21,873,450 | 19,782,082 | 20,392,866 |
| Foreign Countries | 62,650 | 96,550 | 45,918 | 67,134 |
| Total shipped from cement plants | 21,411,000 | 21,970,000 | 19,828,000 | 20,460,000 |

## Relation of Production to Capacity

| | October | | September | August | July |
|---|---|---|---|---|---|
| | 1928 | 1927 | 1928 | 1928 | 1928 |
| | Per cent | Per cent | Per cent | Per cent | Per cent |
| The month | 87.1 | 87.4 | 91.7 | 93.1 | 87.0 |
| The 12 months ended | 73.8 | 73.6 | 73.7 | 73.5 | 73.7 |

## Production and stocks of clinker, by months, in 1927 and 1928. (In thousands of barrels)

| Month | Production | | Stocks end of month | |
|---|---|---|---|---|
| | 1927 | 1928 | 1927 | 1928 |
| January | 10,410 | 11,839 | 9,989 | 9,672 |
| Feburary | 9,253 | 11,363 | 11,943 | 12,237 |
| March | 12,397 | 12,501 | 12,997 | 14,463 |
| April | 14,246 | 13,844 | 13,335 | 15,002 |
| May | 15,677 | 16,025 | 12,514 | 14,329 |
| June | 15,437 | 15,940 | 10,926 | 12,944 |
| July | 15,697 | 15,981 | 9,609 | 11,707 |
| August | 16,396 | 16,202 | 7,887 | 9,357 |
| September | 15,931 | 15,909 | 6,490 | 7,566 |
| October | 16,469 | 15,782 | 5,960 | 5,975 |
| November | 14,698 | ..... | 6,374 | ..... |
| December | 13,177 | ..... | 7,660 | ..... |

## Production, shipments, and stocks of finished Portland cement, by months, in 1927 and 1928. (In thousands of barrels)

| Month | Production | | Shipments | | Stocks at end of month | |
|---|---|---|---|---|---|---|
| | 1927 | 1928 | 1927 | 1928 | 1927 | 1928 |
| January | 8,258 | 9,768 | 5,968 | 6,541 | 22,914 | 25,116 |
| February | 7,377 | 8,797 | 6,731 | 6,563 | 23,563 | 27,349 |
| March | 11,450 | 10,223 | 11,100 | 10,135 | 23,922 | 27,445 |
| April | 14,048 | 13,468 | 14,350 | 13,307 | 23,654 | 27,627 |
| May | 16,701 | 17,280 | 16,865 | 18,986 | 23,503 | 25,984 |
| June | 17,224 | 17,469 | 19,761 | 18,421 | 20,972 | 25,029 |
| July | 17,408 | 17,445 | 18,984 | 19,901 | 19,397 | 22,580 |
| August | 18,315 | 18,730 | 21,411 | 21,970 | 16,292 | 19,374 |
| September | 17,505 | 17,856 | 19,828 | 20,460 | 13,996 | 16,799 |
| October | 17,174 | 17,533 | 18,105 | 19,836 | 13,141 | 14,495 |
| November | 14,449 | ..... | 11,619 | ..... | 16,022 | ..... |
| December | 11,999 | ..... | 6,200 | ..... | 22,082 | ..... |
| | 171,908 | ..... | 170,922 | ..... | ..... | ..... |

# CEMENT STATISTICS FOR OCTOBER

The Portland cement industry in October, 1928, produced 17,533,000 barrels, shipped 19,836,000 barrels from the mills, and had in stock at the end of the month 14,495,000 barrels, according to the United States Bureau of Mines, Department of Commerce. The production of Portland cement in October, 1928, showed an increase of 2.1 per cent and shipments an increase of 9.6 per cent, as compared with October, 1927. Portland cement stocks at the mills were 10.3 per cent higher than a year ago. The total production from January to October, 1928, inclusive, amounts to 148,569,000 barrels, compared with 145,460,000 barrels in the same period of 1927, and the total shipments from January to October, 1928, inclusive, amount to 156,120,000 barrels, compared with 153,103,000 barrels in the same period of 1927.

The statistics here presented are compiled from reports for October from all manufacturing plants except two for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 159 plants at the close of October, 1928, and of 154 plants at the close of October, 1927.

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## New Corporations

Big Harbor Gypsum Syndicate, Ottawa, Ont., Can. $350,000. Will develop quarries at Cape Breton, N. S., Can.

Wassaic Sand & Stone Corp., Amenia, N. Y. 1,000 shares n.p.v. D. G. McCullough, Poughkeepsie, N. Y.

Ohio Aggregates Co., Perry Quale, Pres., Western Reserve Bldg., Cleveland, Ohio, c/o Ohio Coal & Supply Co., producers of crushed stone, sand and gravel. 100 shares n.p.v. J. C. Reasner, Louis H. Wieber, M. A. Klein.

Superior Sand & Gravel Co., Denver, Colo. $25,000. Chas. W. Edwards, Harry Conway, Clarence L. Ireland.

Middlesex Sand & Gravel Co., Watertown, Mass. $99,000. Chas. H. Hodge, John S. Lovell, Delbert S. Smith.

Clinton River Washed Sand & Gravel Co., 1717 Dime Bank Bldg.,

Detroit, Mich. $10,000. David Oppenheim, 1980 Chicago Blvd., Detroit; Frederick H. Craine, Wm. S. Craine, Rochester.

Bexley Sand & Gravel Co., Edw. D. Howard, 16 E. Broad St., Columbus, O., $25,000. Anna Louise Hyde, Collis Gundy Lane.

National Diatomite Corp., Clermont, Fla. $500,000. To produce diatomite from diatomaceous earth. Robt. E. Curtis, Wilmington, Del.

Natural Rock Asphalt Sales Corp., Tampa, Fla. $25,000. H. Kimberland, A. Larrimer.

Mammoth Slate Co., Inc., Fair Haven, Vt. $200,000. C. R. Beach, M. D. Beach, Fair Haven; Chas. H. Beach, Castleton.

Maritime Portland Cement Co., Ltd., Brockville, Ont., Can. 7,500 shares pfd.; 20,000 shares n.p.v.

Northern Utilities Service Corp., c/o U. S. Corp. Co., Wilmington, Del. 320,000 shares n.p.v. Natural or other cement, lime, calcium.

Genereau & Fanzini, Inc., Auburn Heights, Mich. $20,000. Will develop gravel pit. Joseph Genereau, James Fanzini, Victoria Genereau, Route 6, Box 120, Royal Oak, Mich.

Hugo Sand Co., 1130 Williamson Bldg., Cleveland, O. $50,000. H. B. Howells, Hildegards L. Burns, H. E. Michaelis.

Missouri-Kansas Gravel Co., Pittsburg, Kans. $5,000.

Wyandot Stone Co., Kenton, Ohio. $25,000. Quinton M. Bradshaw, Bertha King, Foster E. King.

Charlotte Stone Co., Charlotte, N. C. $75,000. Geo. H. Moore, 427 Queens Road, Myers, N. C.

Innerkip Quarries, Ltd., Toronto, Ont., Can. $500,000. James Franceschini.

Texas Nitrate Corp., Houston, Tex. $75,000. J. V. Chapman, L. D. Brown, J. E. Cabiness.

Dixie Bauxite Co., Little Rock, Ark. $40,000. P. A. Dulin, O. A. Olsen.

Arkansas Sand & Material Co., Pine Bluff, Ark. $50,000. Frank R. Allen, formerly City Engr., Pine Bluff; Marvyn Jones, formerly of St. Louis, Mo.; R. W. Crimm, Kansas City, Mo.

Jayhawk Sand-Gravel Co., Irving, Kans. New corp. $20,000. R. G. Yingling, Pres.; R. A. Keefover, Sec.; E. G. Saunders, Howard Yingling, J. E. Yingling, C. E. Garlinghouse.

International Silica Corp., Salem, Va. $200,000. M. M. Caldwell, Pres., Roanoke, Va. Attorneys, Caldwell, Chaney & Loyd, Roanoke, Va.

Horton Gravel Railroad Co., Houston, Tex. $5,000. J. P. Miller, W. A. Marchand, N. B. Brunson.

# EXPORTS AND IMPORTS

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

## Exports of hydraulic cement by countries in September, 1928

| Exported to— | Barrels | Value |
|---|---|---|
| Canada | 3,787 | $19,204 |
| Central America | 15,300 | 36,316 |
| Cuba | 4,500 | 13,168 |
| Other West Indies and Bermuda | 2,005 | 6,791 |
| Mexico | 5,423 | 17,904 |
| South America | 34,860 | 123,141 |
| Other countries | 6,120 | 36,319 |
| | 71,995 | 252,843 |

## Imports of hydraulic cement by countries, and by districts, in September, 1928

| Imported from— | District into which imported | Barrels | Value |
|---|---|---|---|
| Belgium | Florida | 20,300 | $25,516 |
| | Galveston | 18,567 | 23,632 |
| | Los Angeles | 500 | 598 |
| | Massachusetts | 33,243 | 45,136 |
| | New York | 8,717 | 9,195 |
| | Oregon | 5,200 | 6,516 |
| | South Carolina | 47,310 | 57,001 |
| | Virginia | 600 | 664 |
| | Washington | 9,800 | 12,792 |
| | Total | 144,237 | 181,050 |
| Canada | Maine and New Hampshire | 4,500 | 10,848 |
| | San Francisco | 2 | 6 |
| | Total | 4,502 | 10,854 |
| Denmark | Porto Rico | 2,000 | 2,528 |
| France | New York | 691 | 1,444 |
| Germany | New York | 1,000 | 2,450 |
| Norway | Philadelphia | 7,069 | 8,006 |
| United Kingdom | Galveston | 12,000 | 15,785 |
| | Los Angeles | 300 | 625 |
| | New York | 1,340 | 2,927 |
| | San Francisco | 300 | 626 |
| | Total | 13,940 | 19,963 |
| | Grand Total | 173,439 | 226,295 |

## Exports and imports of hydraulic cement, by months, in 1927 and 1928

| | Exports | | | | Imports | | | |
|---|---|---|---|---|---|---|---|---|
| | 1927 | | 1928 | | 1927 | | 1928 | |
| Month | Barrels | Value | Barrels | Value | Barrels | Value | Barrels | Value |
| January | 75,346 | $ 254,072 | 56,400 | $ 204,875 | 193,175 | $ 269,661 | 234,753 | $ 342,797 |
| February | 71,404 | 233,985 | 62,828 | 221,620 | 130,421 | 200,680 | 164,408 | 217,525 |
| March | 67,956 | 240,165 | 74,983 | 265,719 | 181,145 | 261,519 | 235,930 | 330,074 |
| April | 72,383 | 243,832 | 61,676 | 205,882 | 192,318 | 313,262 | 249,458 | 324,371 |
| May | 59,332 | 205,574 | 70,173 | 236,005 | 178,929 | 263,618 | 190,509 | 256,872 |
| June | 69,205 | 237,281 | 59,536 | 201,313 | 129,111 | 291,682 | 266,537 | 359,637 |
| July | 72,337 | 249,737 | 83,759 | 291,055 | 175,042 | 249,665 | 112,887 | 151,877 |
| August | 61,371 | 209,198 | 88,736 | 302,866 | 117,605 | 170,167 | 259,988 | 358,858 |
| September | 57,890 | 207,817 | 71,995 | 252,843 | 233,066 | 304,796 | 173,439 | 226,295 |
| October | 67,639 | 230,668 | ..... | ..... | 221,274 | 321,777 | ..... | ..... |
| November | 79,764 | 257,428 | ..... | ..... | 141,485 | 190,419 | ..... | ..... |
| December | 62,099 | 226,960 | ..... | ..... | 156,609 | 209,205 | ..... | ..... |
| | 816,726 | 2,796,717 | ..... | ..... | 2,050,180 | 2,956,451 | ..... | ..... |

## Domestic hydraulic cement shipped to Alaska, Hawaii, and Porto Rico, in September, 1928

| | Barrels | Value |
|---|---|---|
| Alaska | 290 | $ 874 |
| Hawaii | 27,169 | 63,916 |
| Porto Rico | 2,281 | 5,518 |
| | 29,740 | $70,308 |

## Production and stocks of clinker (unground cement), by districts, in October, 1927 and 1928. (In thousands of barrels)

| | Production | | Stocks at end of month | |
|---|---|---|---|---|
| District | 1927 | 1928 | 1927 | 1928 |
| Eastern Pennsylvania, New Jersey and Maryland | 3,744 | 3,265 | 766 | 867 |
| New York and Maine | 1,128 | 1,103 | 281 | 627 |
| Ohio, Western Pennsylvania and West Virginia | 1,697 | 1,856 | 634 | 529 |
| Michigan | 1,357 | 1,303 | 440 | 527 |
| Wisconsin, Illinois, Indiana and Kentucky | 2,164 | 2,122 | 281 | 216 |
| Virginia, Tennessee, Alabama, Georgia, Florida and Louisiana | 1,516 | 1,445 | 691 | 720 |
| Eastern Missouri, Iowa, Minnesota and South Dakota | 1,537 | 1,444 | 408 | 292 |
| Western Missouri, Nebraska, Kansas and Oklahoma | 1,064 | 1,089 | 231 | 303 |
| Texas | 535 | 570 | 179 | 112 |
| Colorado, Montana and Utah | 145 | 222 | 454 | 315 |
| California | 1,276 | 1,089 | 1,242 | 1,188 |
| Oregon and Washington | 306 | 274 | 353 | 279 |
| | 16,469 | 15,782 | 5,960 | 5,975 |

## Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,684,943. Mining-machine. Frank Cartlidge, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,685,018. Screening-machine. John O. Bowmaster, Orbisonia, Pa.

1,685,139. Sand cutting, screening, and piling machine. Elmer R. Rich, Jr., assignor to American Foundry Equipment Co., New York, N. Y.

1,685,306. Steering apparatus for motor-driven vehicles. Edwin J. Armstrong, Erie, Pa., assignor to Bucyrus-Erie Co., South Milwaukee, Wis.

1,685,403. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,685,463. Shaker conveyer. John H. D. Petersen and John W. Wilson, Chicago, Ill., assignors to Link-Belt Co., same place.

1,685,466. Ore-separator. Eddie H. Stepp, Knoxville, Tenn.

1,685,828. Ore-grading machine. Vicente Sanchez, Ponemah, Ill.

1,686,127. Apparatus for handling loose material. Charles E. Davis, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,686,128. Adjustable hammer for disintegrators and the like. William M. Duncan, Alton, Ill.

1,686,140. Mining-machine. William T. McCullough, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,686,147. Scraper loading device. Charles E. Davis, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,686,148. Scraper. Charles E. Davis, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,686,176. Lever-arm bucket. Philip T. Robin, Aspinwall, and William Y. Venable, Pittsburgh, Pa., assignors to Blaw-Knox Co.

1,686,337. Mining and loading apparatus. Edmund C. Morgan, New York, N. Y.

1,686,372. Steering mechanism. Mitchell L. Fykse, Milwaukee, Wis., assignor to Bucyrus-Erie Co., South Milwaukee, Wis.

1,686,660. Construction of concrete piles. Alfred Hiley, Rickmansworth, England, assignor to British Steel Piling Co., Ltd., Westminster, England.

1,686,917. Magnetic ore-separator. William L. McAdams, Coquille, Ore.

1,687,022. Tooth for excavating-shovels. William T. Hulsizer, Clinton, N. J.

1,687,227. Method for concrete mixtures. John D. Powell, Cincinnati, Ohio.

1,687,299. Back-movement lock for paver buckets. Erich H. Lichtenberg, Milwaukee, Wis., assignor to Koehring Co., same place.

1,687,306. Mining-machine. Edward O'Toole, Gary, W. Va.

1,687,499. Batch-hopper. Charles S. Johnson, Champaign, Ill.

1,687,653. Steering mechanism. Svante R. W. M. Bager, South Milwaukee, Wis., assignor to Bucyrus-Erie Co., same place.

1,687,660. Mixer for road materials. Frederick H. Cummer, Los Angeles, Cal.

1,687,841. Power-operated portable loader. George Manierre, Milwaukee, Wis.

1,688,064. Concrete pile. Maxwell M. Upson, Englewood, N. J.

1,688,324. Bucket. Herbert S. Atkinson, East Orange, N. J., assignor to Hayward Co., New York, N. Y.

1,688,572. Steering mechanism. Svante R. W. M. Bager, South Milwaukee, Wis., assignor to Bucyrus-Erie Co., same place.

1,688,643. Steering mechanism for cranes. Gardner A. Murfey and Arthur S. Meyer, Cleveland Heights, Ohio, assignor to Browning Co., Cleveland, Ohio.

1,688,664. Dipper-handle. William M. Sheehan, St. Louis, Mo., assignor to Commonwealth Steel Co., Granite City, Ill.

1,688,882. Art of cement manufacture. Walter A. Schmidt, Los Angeles, Cal., assignor to International Precipation Co., same place.

1,689,122. Bail for excavating dippers and the like. Berlin S. Ferguson, Marion, Ohio, assignor to Marion Steam Shovel Co., same place.

1,689,143. Carriage for concrete mixers and distributors. Joseph C. Lukachovic, Chicago, and Harry C. Peters, Oak Park, Ill.

1,689,237. Manufacture of finishing lime. Victor M. Frey, York, Pa.

1,689,342. Machine for spreading sand, gravel, etc. Isaac E. Hiller, Marion, Mass.

1,689,365. Dump-car-body-tilting bearing. Alfred C. Schmohl, Beaver Falls, and John P. Anderson, Koppel, Pa., assignors to Koppel Industrial Car & Equipment Co., Pittsburgh, Pa.

1,689,586. Mining apparatus. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,689,963. Concrete mixer and conveyor. Benjamin H. Pelton, Carlsbad, Cal.

1,689,981. Laterally-adjustable excavator-boom structure. George A. Vaughn, Newton, Iowa, assignor to Parsons Co., same place.

1,690,125. Grinding mill. Charles E. Needham, Allentown, Pa., assignor to Bethlehem Foundry & Machine Co.

1,690,239. Plow and jet-elevator dredge. John M. Nichol, Mill Valley, Cal.

1,690,494. Mill. Frank E. Marcy, San Diego, Cal.

1,690,495. Mill. Frank E. Marcy, San Diego, Cal.

1,690, 496. Mill. Frank E. Marcy, San Diego, Cal.

1,690,497. Mill. Frank E. Marcy, San Diego, Cal.

1,690,574. Dredger-bucket mounting and operating structure. John E. Funk, Stockton, Cal.

1,690,667. Minute disintegration of substances. Frederick J. E. China, Esher, England.

1,690,668. Disintegrating device. Frederick J. E. China, Esher, England.

1,690,712. Pulverizing-mill. Louis C. Bonnot, Louisville, Ohio, assignor to Bonnot Co., Canton, Ohio.

1,690,834. Replaceable-point excavator-tooth. Thomas Ratkowski, Chicago Heights, Ill., assignor to American Manganese Steel Co., Chicago, Ill.

1,690,835. Excavator-lip with integral teeth. Thomas Ratkowski, Chicago Heights, Ill., assignor to American Manganese Steel Co., Chicago, Ill.

1,690,849. Concrete-mixer water control. Orson C. Barrymore and Reginald A. Daddisman, San Francisco, Cal., assignors to Barrymore Concrete Mixer Corporation, same place.

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## District Offices Opened By U. S. Gypsum

The United States Gypsum Company now has district sales offices at Atlanta, Georgia; Memphis, Tennessee; St. Louis, Missouri; and Dallas, Texas. The Atlanta office, 1510 Candler Building, is in charge of J. B. McCorkle; Memphis, 1500 Bank of Commerce Building, in charge of Frank Miller; St. Louis, 1201 Syndicate Trust Building, R. E. Sherer; and Dallas, Santa Fe Building, in charge of C. D. Hausner.

## New York Plant Resumes

The Seaville Sand and Gravel Company, Seaville, New York, is resuming the production of silica sand. A 250 h. p. motor is being installed.

## Cement Industry For October

The ratio of the operations to the capacity of the American portland cement industry during the month of October was 87.1 per cent, according to figures released by the Bureau of Mines of the Department of Commerce. During the month 17,533,000 barrels were produced, 19,836,000 barrels were shipped, and there were in stocks on hand at the end of the month 14,495,000 barrels. Production in October, 1928, was 2.1 per cent more, and shipments 9.6 per cent more than in October, 1927. Stocks at the mills were 10.3 per cent higher than a year ago.

## Indiana Plant Expands

The Banner Rock Products Company, which operates a plant near Alexandria, Indiana, recently opened a second quarry to supply rock for this plant.

## Idaho Talc Mines Sold

The Garner Electrical Range Company recently purchased a factory site with building and equipment in Spokane, Washington, for a consideration of $18,000. Talc mines have also been purchased in the Salmon river district near Kellog, Idaho, and will produce the talc forming the base of the elements used in the manufacture of electrical equipment. W. C. Garner is president of the company and C. B. Seimer is general sales manager.

## New Batching Plant For Cincinnati

The storage and batching bins to form a ready mixed concrete plant for the Avril Tru-Batch Concrete Company was designed by the Blaw-Knox Company. It made the complete engineering layout of this plant and in the opinion of non-interested engineers and contractors, it is considered an excellent example of efficient, modern plant, economical in operation.

A. C. Avril, the president and general manager of the Company, in planning the plant had as his object at all times a plant that would be efficient enough to withstand any inspection and produce a concrete mix as true to a mix made in a laboratory as possible. This had to be accomplished with ordinary laborers operating the plant and at a minimum labor cost.

A New Batching Plant.

The plant, as can be seen in the accompanying illustration, consists of four 18 foot diameter circular bins, each having a capacity of 196 tons, one 15 foot diameter cement bin, having a capacity of 110 tons or 587 barrels, one 200 ton four compartment batching bin, one bucket elevator, one belt conveyor, one enclosed elevator and a two yard mixer. The four circular bins are used for storing the aggregates—sand, gravel and crushed stone. The use of these bins for storage, instead of the stock pile method, prevents segregation and as a result maintains the graduation of the aggregates, thus allowing the concrete to be designed on a fineness modulus basis. When such a design is used in combination with W/C control the strength and quality of the concrete is assured. Mr. Avril splits the coarse aggregate into three sizes and in a batch uses a portion of each size. By recombining these separated sizes for the successive batches, any graduation of coarse aggregate may be had.

The aggregates are conveyed from the four storage bins to the batching bin by a belt conveyor. The batching bin is equipped with four single weighing batchers. These weighing batchers are accurate to the pound and each batcher is equipped with a separate scale whose reading beam is enclosed in a box. Each scale is equipped with a dial which weighs the last 200 pounds of each batch. This insures the operator against having an over run and speeds up the operation.

The cement for the concrete produced at this plant is delivered in bulk in railroad cars. The cement is conveyed from the cars to the circular bin by means of an enclosed bucket elevator. The cement bin is a 15 foot circular bin with a steel cover and has a side discharge bottom hopper. The cement bin is equipped with a weighing batcher, having a separate scale whose reading beam is enclosed in a box. This scale also carries an auxiliary dial. The batcher discharges on a belt conveyor which conveys the cement to the batch hopper in the mixer.

This plant does not require expert or skilled labor for operation and to produce the maximum output of 60 yards per hour requires only four laborers and one foreman. These men unload the aggregate cars, charge the batching bin, unload the cement cars, batch the aggregates, operate the mixer and load the trucks. Any design of mix can be produced instantaneously at this plant without any delays from batch to batch.

## Slate Production in the United States

The active slate-producing districts of the country, according to "Slate in 1927," published by the United States Bureau of Mines, Department of Commerce, are the Monson district of Maine; the New York-Vermont district, including Washington County, New York, and Rutland County, Vermont; the Lehigh district, including Lehigh and Northampton Counties, Pennsylvania; the Peach Bottom district, including Lancaster and York Counties, Pennsylvania, and Hartford County, Maryland; Berks County, Pennsylvania; and the Buckingham County and Albemarle County districts of Virginia. These districts produce roofing slate and mill stock; some of them also produce roofing granules and slate flour. Roofing granules and flour are also produced in California, Georgia, and Tennessee.

Pennsylvania is the largest producer of slate (exclusive of slate granules) in the United States and also produces a greater variety of slate products than any other state, although Maine and Vermont both outrank it in output of electrical slate.

The New York-Vermont slate district is practically continuous. These two states produce all of the colored slates used for roofing. Red slate is the chief product of the New York quarries, but they also produce, with those of Vermont, the various green, purple, variegated, mottled, and "freak" slates in demand for roofs. The output of the New York quarries is chiefly for red granules with a small output for roofing slate and slabs for walk ways, flagging, etc.

The Vermont quarries produce roofing slate, mill stock, granules, and slate for walks, etc. The colors are in wide variety and combinations of green and purple and are generally classed as green, unfading green, unfading mottled green and purple, weathering green, purple, variegated, and "freak." There are also black and gray varieties. Most of the granules manufactured are green. Much of the roofing slate produced in Vermont is, as in New York, quarried and shaped by owners of small quarries that are worked at irregular intervals. This slate is generally of unusual color and specially sized and is sold through operators of large quarries or through dealers. On account of the variety of colored slates found in the district much of the roofing slate commands a high price.

## Preparation and Uses of Feldspar

The average person probably has but little knowledge of the mineral feldspar, whereas the material really has its place in the everyday life of all, points out the United States Bureau of Mines, in "Feldspar in 1927" by Jefferson Middleton. The plate from which one eats his meal is glazed with feldspar. Our enamel cooking ware, enamel sinks and bathroom furniture are practically all glazed with a composition containing feldspar, so that the mineral might in fact be called a close family friend instead of a stranger.

The uses of feldspar are manifold. Its principal use is as a flux in the pottery, glass, and enameling industries, including tiles, porcelains, and so-called marbles that find their use in hotels, restaurants, drug stores, and other places where a vitrified surface is desired for sanitary reasons. It is also used as an abrasive in scouring soap, as a binder in the manufacture of abrasive wheels, as poultry grit, as a constituent of roofing material, and in stucco or pebble dash. Small quantities of the purest grades of potash feldspar are used in the manufacture of artificial teeth. Efforts to use feldspar as a source of supply of potash on a commercial scale continue, but claims of success remain unestablished.

Probably all the feldspar consumed industrially, except that used for facing cement work, for covering prepared roofing, for "chicken grits," and like purposes, is prepared by fine grinding. Even for such uses the spar is at least crushed to small sizes and more or less graded by screening.

Information in regard to the feldspar industry of the United States is contained in the Bureau of Mines publication, "Feldspar in 1927," by Jefferson Middleton, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 5 cents.

## California Firm Leases

The Featherstone Insulation Company of Los Angeles, California, has leased the Rancho Canada de Salsipuedes, near Lompoc, from its owners, the Hollister Ranch Company. Mining of diatomaceous earth deposits is to begin immediately. Under the terms of the lease the company is to spend $50,000 this year in installation of machinery and $50,000 more during the coming year. Robert Burhans, Jr., is president of the company.

## Lime Plant Opens New York Office

The Rockland and Rockport Lime Corporation, Rockland, Maine, has opened new general offices at 50 E. 42nd St., New York City. Donal O'Connor is general sales manager for this company and the associated Hoosac Valley Lime Company.

## Universal Cement to Install Dust Collecting System

The Universal Portland Cement Company, Buffington, Indiana, has completed a monolithic concrete chimney 301 feet 6 inches high at the plant in that city. A dust collecting system is to be installed at a cost of $1,500,000.

## Alpha Cement Improves Ohio Plant

The Alpha Portland Cement Company plans to install two electrically operated elevators at the Ironton, Ohio, plant to carry limestone from the mine. The shaft of the mine, which is 560 feet deep, is to be walled with concrete. Several electric cranes and other equipment will also be installed. F. C. Brownstead is superintendent.

## Mexican Cement Company Improving Plant

The Compania de Cemento Portland "Landa" of Puebla, Mexico, is making extensive improvements at its mill. A 6 by 70 foot kiln with dryer attached and a 6 by 131 foot kiln are being installed, as well as a number of lime kilns and a lime hydrating plant. A large craneway and additional clinker and gypsum storage facilities are being provided. Clay and limestone storage silos are to be equipped with Schaffer poidometers.

## Indiana Stone Plant Office Completed

The new stone office building of the Bert G. Hoadley Stone Company three miles west of Bloomington, Indiana, was recently completed by the Mitchell Bros. Construction Company.

## Ohio Sand Company Changes Name

The Jones Sand Company, of Columbus, Ohio, producer of steel molding sand, has changed its name to Industrial Minerals Company.

# NEWS OF EQUIPMENT MANUFACTURERS

## Thew and Universal Combine To Build New Shovel

The Universal Crane Company and the Thew Shovel Company of Lorain, Ohio, have combined the respective units of the Universal superstructure with the Thew center drive to produce the Universal 35. This product is a new ½ yard convertible crawler crane and shovel with a complete range of interchangeable attachments. These include a clamshell and a dragline boom, shipper shaft and ditcher type shovels, back digger and skimmer scoop.

The center drive crawler mounting embodies all the features of those now used for the Lorain 75 and 60 shovels and cranes. It consists of an all steel box section casting, resting on four large axles. These axles, any one of which will support the weight of the machine, carry four large rollers on each side. The center two are the drives that obtain power from a common driving pinion gear which constitutes the center drive principle. None of the driving mechanism carries any load, except the driving load and all the driving mechanism runs in oil in a crank case that permits 11 inches clearance beneath the crawler truck. On the center drive shovel, the shipper shaft is placed in the center section of the shovel boom, giving the greatest operating ranges and clearances possible with this length of dipper stick and boom.

Jaw clutches, which are conveniently controlled, slide on square action shafts and engage the crawler for steering or travel. For travelling, two speeds are available, 4/10 miles per hour in low gear on a 35 per cent grade and two miles per hour in high gear on a 12 per cent grade. Easier operation is obtained by replacing one hand lever with a second foot pedal so that three hand levers and two foot pedals control all major operations. The swinging power has been increased about 27 per cent, giving a full revolving swing speed of 4.8 r.p.m.

The boom is 18 feet long, of plate girder construction out to the shipper shaft, and lattice from that point to the boom head. The all steel welded rectangular dipper stick 14 feet, 4 inches long, rides between two large circular bearings which furnish a machined track for a six wheel roller type dipper stick trolley. It is of the most simple design, a shipper shaft pinion and a cable winding drum compose the entire crowding mechanism. This shovel attachment and a series of attachments such as the crane, clamshell and dragline booms, skimmer scoop, ditcher shovel and back digger are all readily interchangeable and adaptable. The hoist shaft is equipped with two drums, separately driven, which are grooved for improved cable life and are used for any of the various attachments.

The superstructure is the same as the Universal Crane Company has been building for motor truck mounting. All the machinery is grouped back of the center pin to act as a counterweight and lift the maximum weight with the minimum dead weight. As a crane, it lifts seven tons at 10 foot radius, handling a ½ yard clamshell or dragline bucket, or a 1 yard backfiller board. As on previous Universals, it is adaptable to several mountings which include the five ton or heavier motor truck, heavy duty trailer or railroad flat car. The Universal 35 will be marketed by the Universal Crane Company through its new general sales offices in Lorain, Ohio, with an international system of sales offices in the principal cities of the United States, Canada and foreign countries.

## Coppersteel Bins

The Beaumont Manufacturing Company of Philadelphia, Pennsylvania, is distributing Catalog 100 in which 15 pages are devoted to describing and illustrating copper steel bins. One page is used in listing other products and one page to the Beaumont cable drag scraper, referring to Catalog No. 95 for additional information concerning the scraper.

These coppersteel bins are constructed entirely of copper steel plate and are said to last two or three times as long as ordinary steel plate bins under the same conditions. These bins are made as single compartment units from capacities of 15 cubic yards to 110 cubic yards, which may be subdivided by partitions and multiple or add-a-bin units to solve almost any storage and space problem. The bins are structurally rigid throughout; answer all possible bin requirements; are easily portable; are equipped with Beaumont all steel duplex gates and sides and sloped to assure a gravity discharge; no projecting columns to prevent bins being placed side by side, and ample truck clearance is provided.

## New Acetylene Plant

A new acetylene plant at East Avenue and Short Street, South Charleston, W. Va., bringing the total number of Prest-O-Lite plants throughout the country up to 35, started producing on October 29th. Dissolved acetylene for welding and cutting will be supplied to local industry from this point.

## National Flue Appoints Sales Representative

The National Flue Cleaner Company, Inc., of Groveville, New Jersey, manufacturers of the National Soot Blower for return tubular boilers, announces the appointments of three new Ohio sales representatives, namely, Craun-Liebing Company of Cleveland, Dennis Engineering Company of Columbus, and the Bishop Engineering Company of Cincinnati.

## Sand and Gravel Book Issued

"Link-Belt Plants for Washing Sand and Gravel" is the title of a new 78 page sand and gravel book, being distributed by the Link Belt Company. In a combination of informative text and interesting pictures, it covers equipment to meet every condition of a pit in any section of the country. It discusses the subject of preparation and the equipment incident thereto including screens, scrubbers, and settling and dewatering devices, as well as loading spouts and gates for gravel and sand.

With the addition, recently, of the Shaw Classifier, Link-Belt now offers four types of settling and dewatering devices to meet varying conditions. These are the dewatering flight conveyor, dewatering screw conveyor, the Dull conical sand separator and the Shaw Classifier.

Excavating and conveying mediums for this industry include the dragline cableway excavators, belt and apron conveyors, bucket and digging elevators, cranes and portable loaders.

Nineteen of the 78 pages contain the reproduction of more than 50 views of sand and gravel plants in the United States and Canada, showing the application of Link Belt equipment. Aside from its carefully presented tables and illustrations, a pleasing feature of the catalog is the opportunity its authors have taken to not only describe each unit, but to orient it with reference to its function in the entire operation of the plant.

A New Dragline Machine

## Page Announces New Machine

The Page Engineering Company announces its 420 model dragline machine. This machine is normally equipped with an 80 foot boom and a 3 cubic yard Class "C" Bucket. Many new features have been incorporated to increase speed and economy. The power plant is a Page Diesel Engine, all frictions are air controlled; bearings are self-aligning. A single hoisting line is used and this line goes directly from the drum to the boom point.

In explanation of the peculiar boom suspension: This particular machine has to excavate several kinds of soils among which is a chalky formation weighing but 1200 pounds a cubic yard. Where it is not necessary to spoil at any great distance, the 5 yard bucket is used and the hoisting line reeved through the ¾ point.

## St. Louis Blowpipe Purchases

The St. Louis Blow Pipe and Heater Company of St. Louis, Missouri, announces the purchase of Pecco, Incorporated, manufacturer of the Pecco standard light weight unit heaters.

## Straight Line Trucking

The Stuebing Cowan Company at Cincinnati in collaboration with its railroad representatives, Leeds, Tozzer and Company, Incorporated, 75 West Street, New York, has just issued an interesting pamphlet entitled "Straight Line Trucking," which describes the use of the lift truck platform system by railroads and other common carriers.

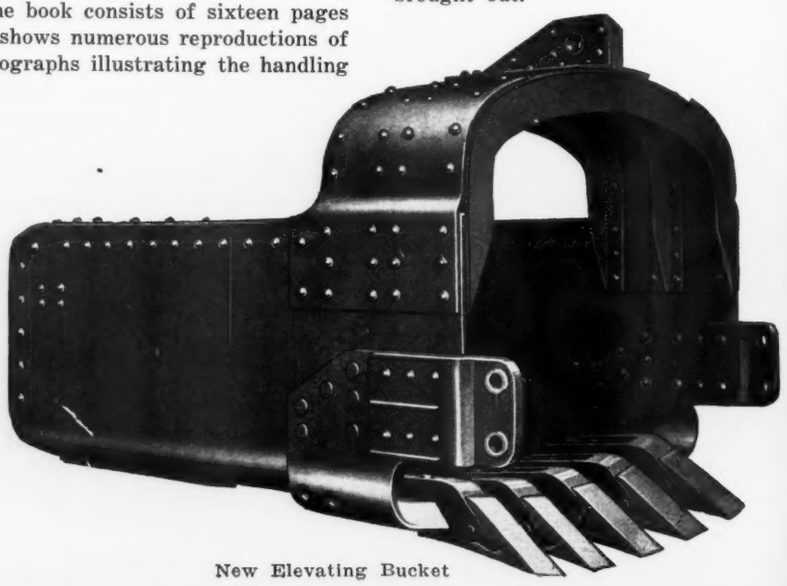
The book consists of sixteen pages and shows numerous reproductions of photographs illustrating the handling of materials in the stores department and machine shops and the handling of freight at railroad and steamship terminals.

## Improved Excavating Bucket With Removable Teeth

An improved type of excavating bucket for slackline cableway excavators was recently placed on the market by Sauerman Bros., Inc., Chicago, Illinois. The Sauerman engineers who designed this bucket have named it the "Universal" because it is adaptable to so many different digging conditions.

Prior to the development of the "Universal" bucket, it was customary to equip a slackline cableway excavator with one type of bucket for digging easy caving material and another type of bucket for digging hard-packed or sticky material. The new bucket takes the place of both the former types of buckets as equipment for Sauerman cableways. For difficult excavation work, it is furnished with teeth; for easy digging, without teeth. All that is necessary to give one of these buckets maximum efficiency in any class of digging is either to put on or remove the teeth. Consequently, it has a wider range of usefulness than any previous cableway excavating bucket.

This bucket is built with an extra heavy manganese lip and a reinforced heavy bail. The bottom is thoroughly protected against wear by means of runner shoes and plates, which are easily renewed when worn. The bottom and corners of the bucket are rounded, permitting easier penetration in digging and cleaner and better release of the load in dumping. It is said to be a better digging unit and carries a better load, size for size, than any slackline bucket previously brought out.



New Elevating Bucket